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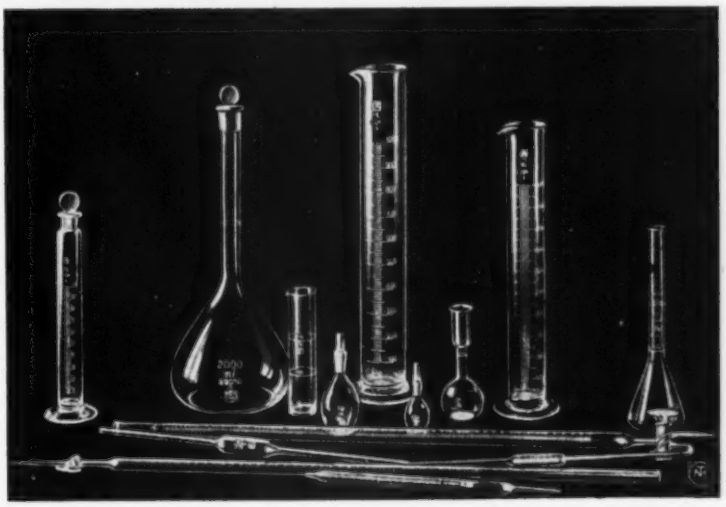

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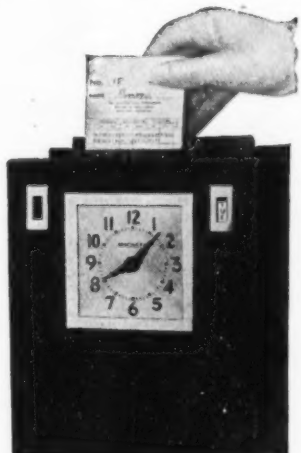
Time . . . still on it creeps, each little moment at another's heels till hours, days, years and ages are made up of such small parts as these. Men look back worn and bewildered, wondering what it is, for it travels like a ship in the wide ocean that has no bounding shore to mark its progress. *Johana Baillien.*



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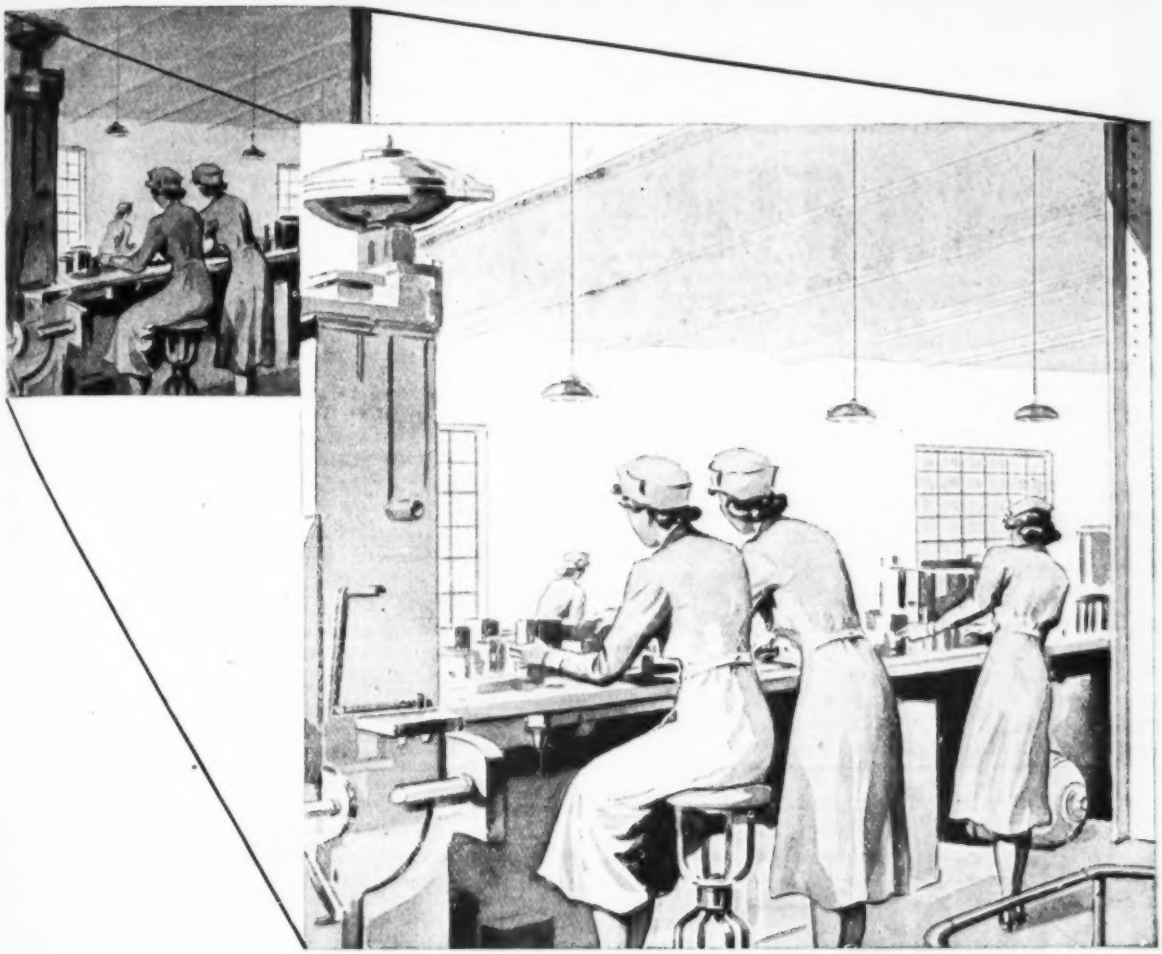

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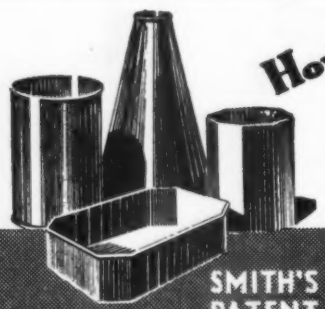

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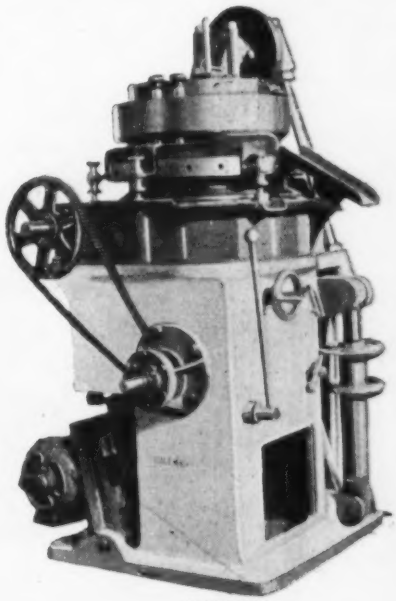

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ROTARY
TABLET MACHINE

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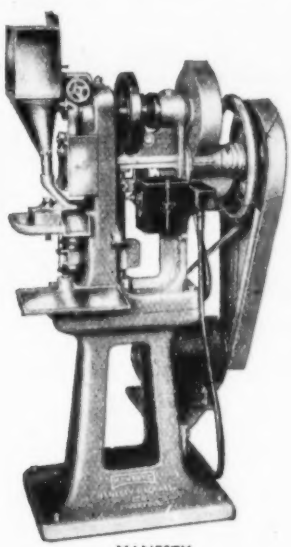

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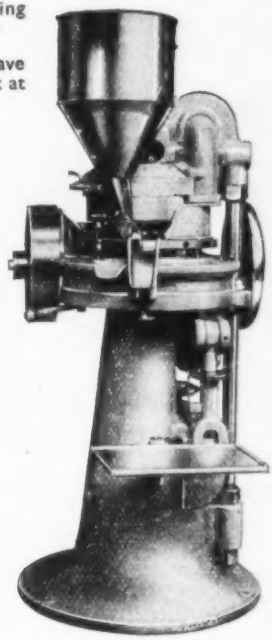

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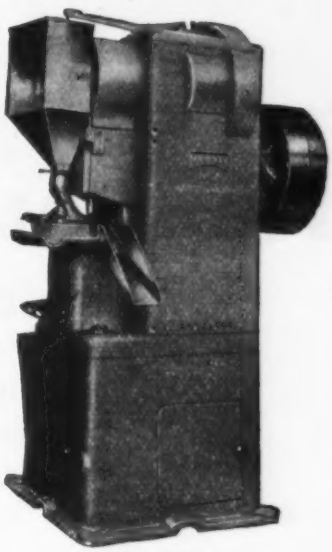

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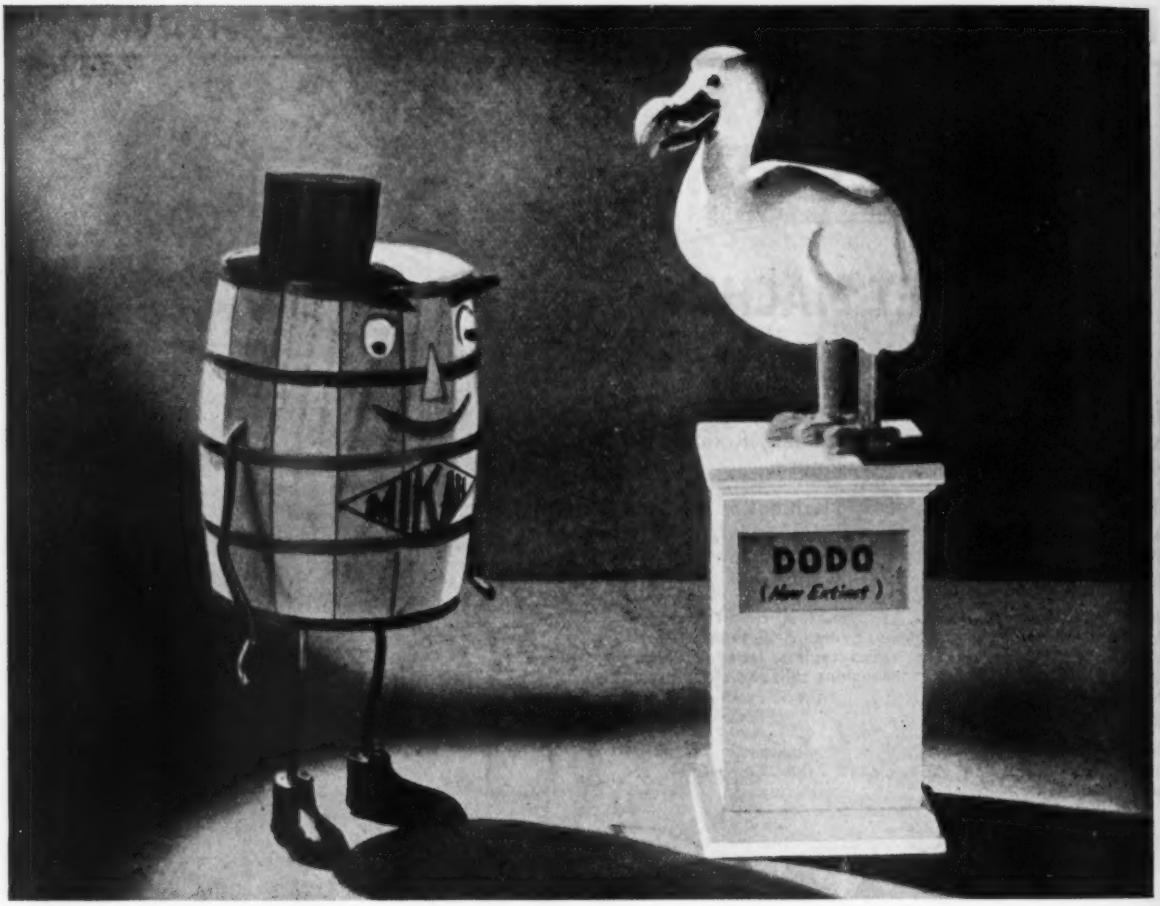

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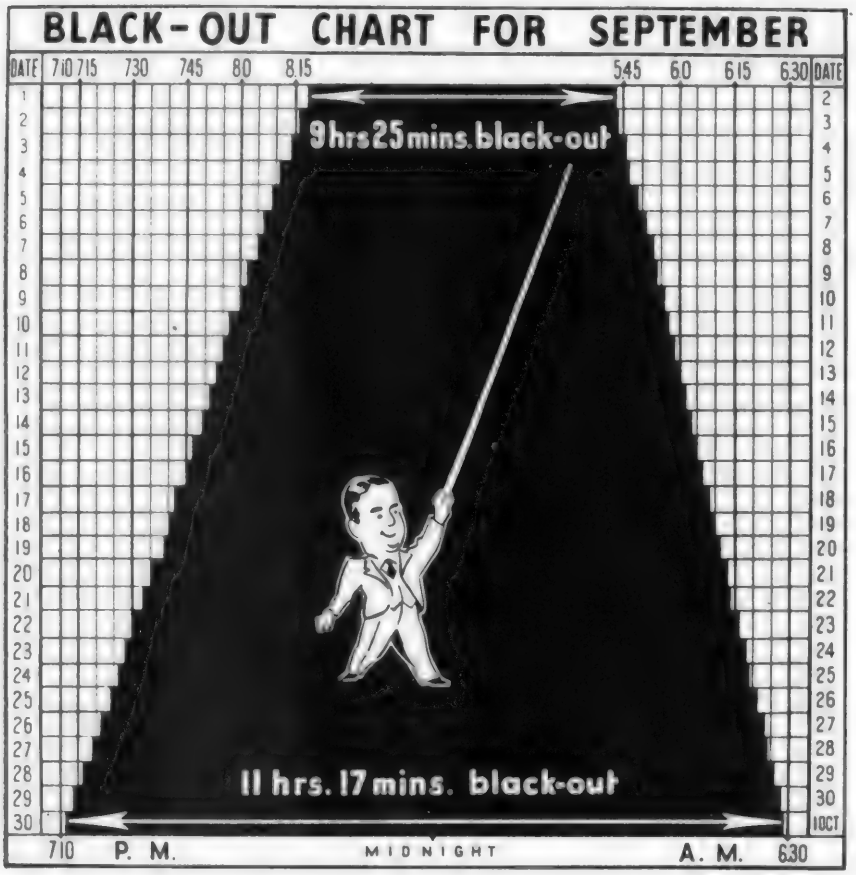

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★ *Times shown are those for the London area.*

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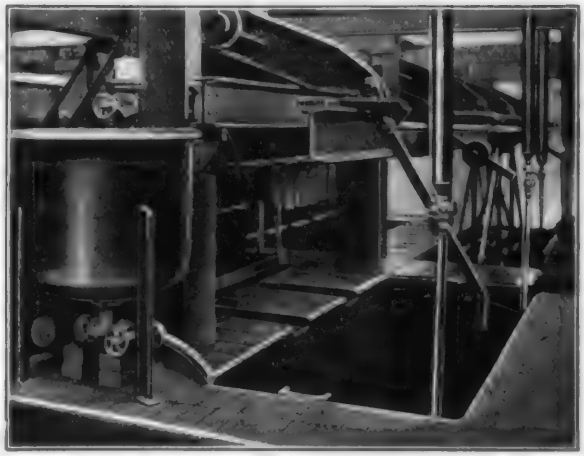

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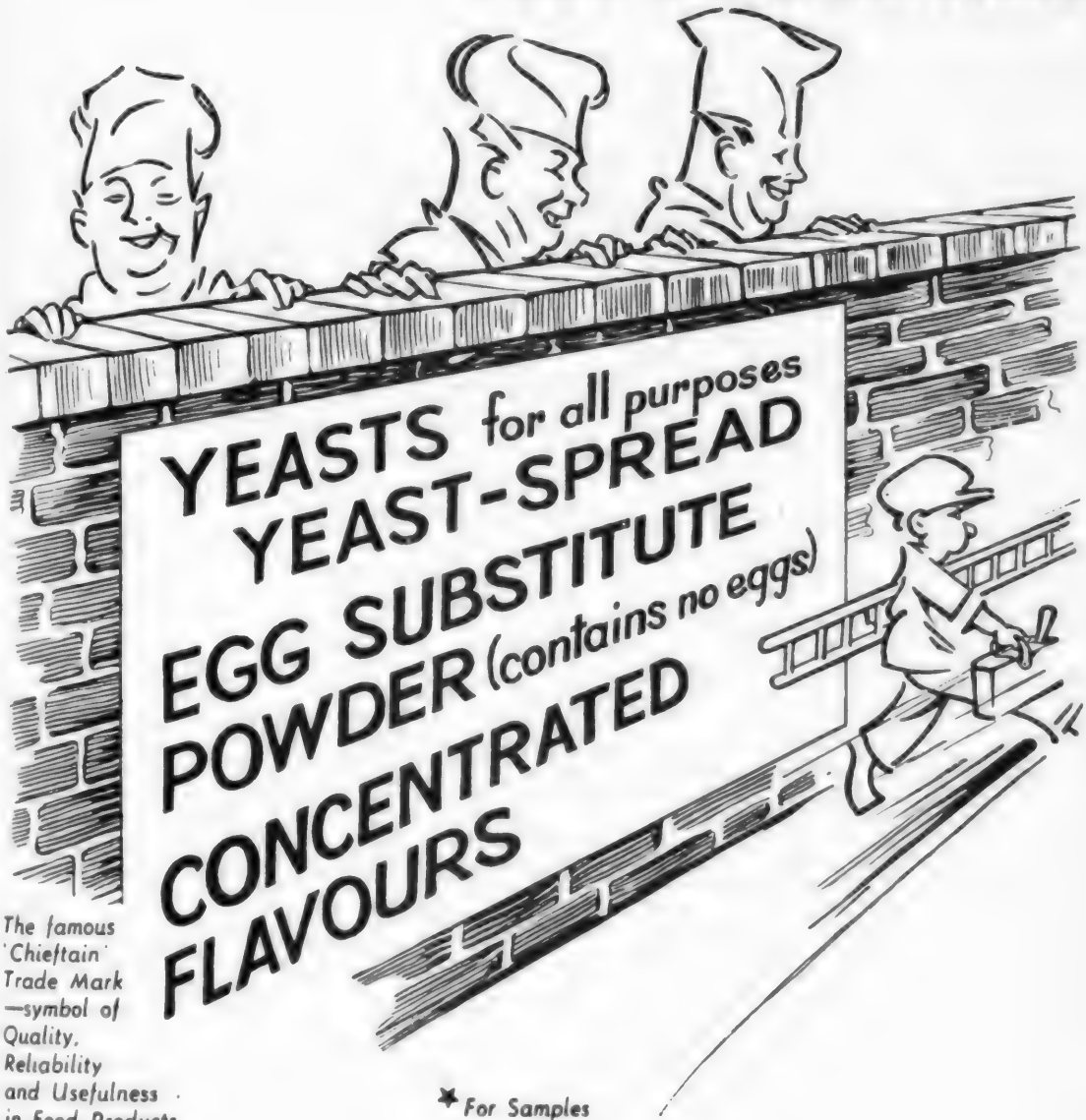

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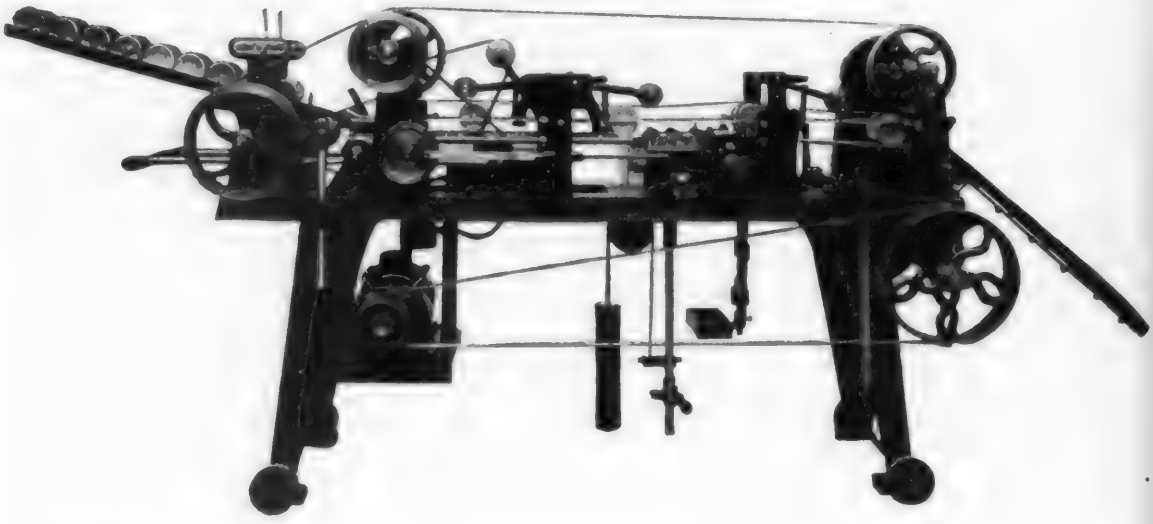

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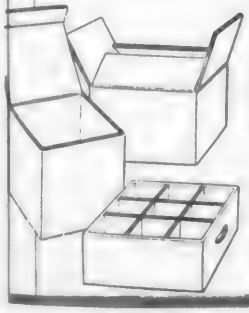

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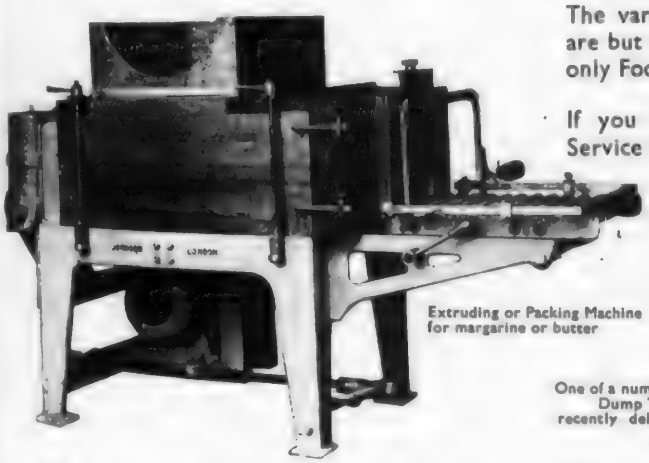

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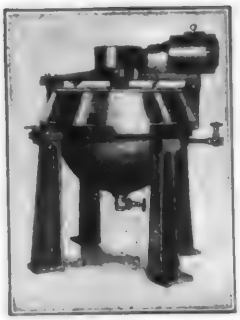

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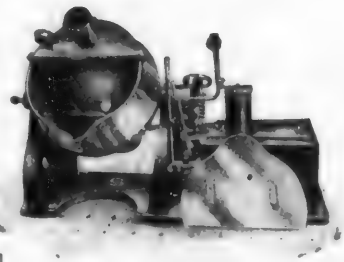

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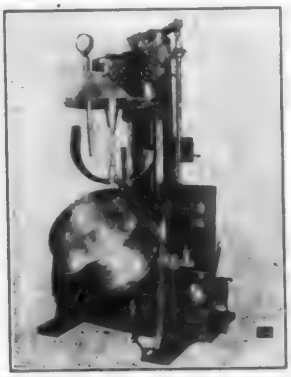

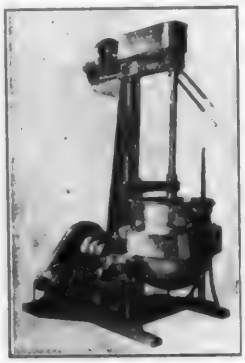

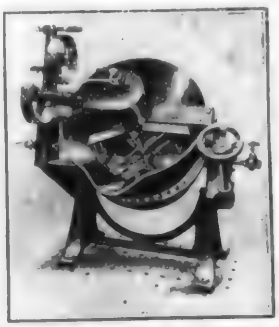

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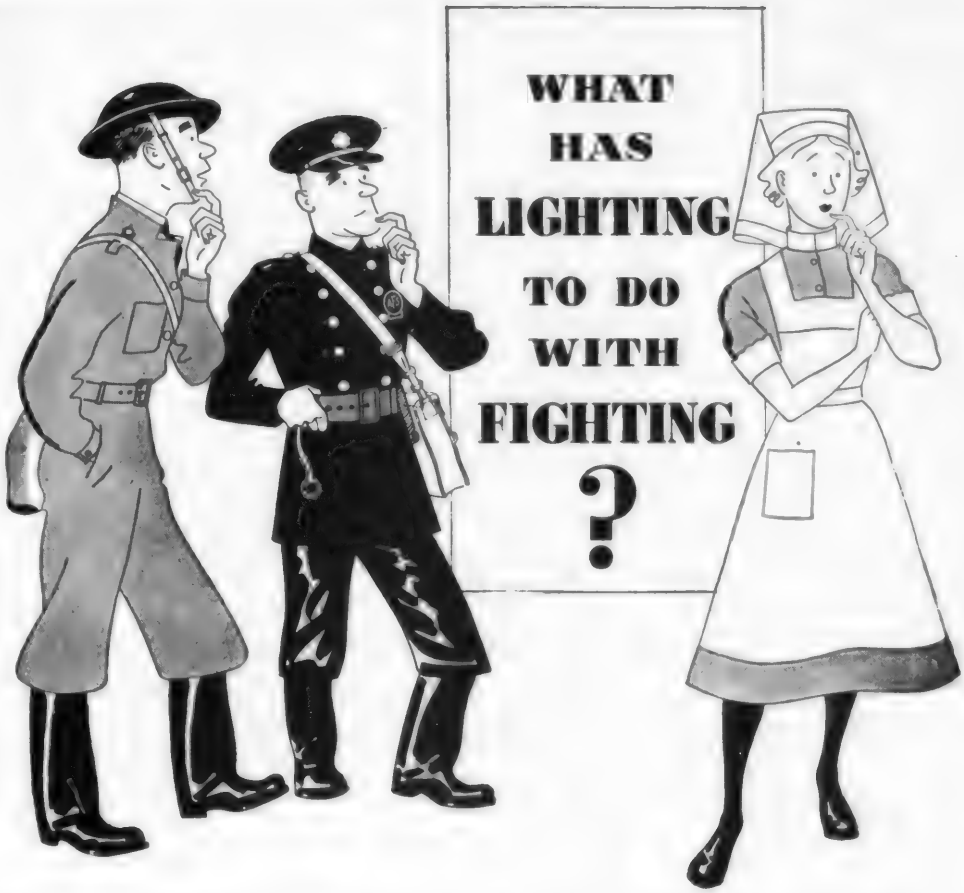

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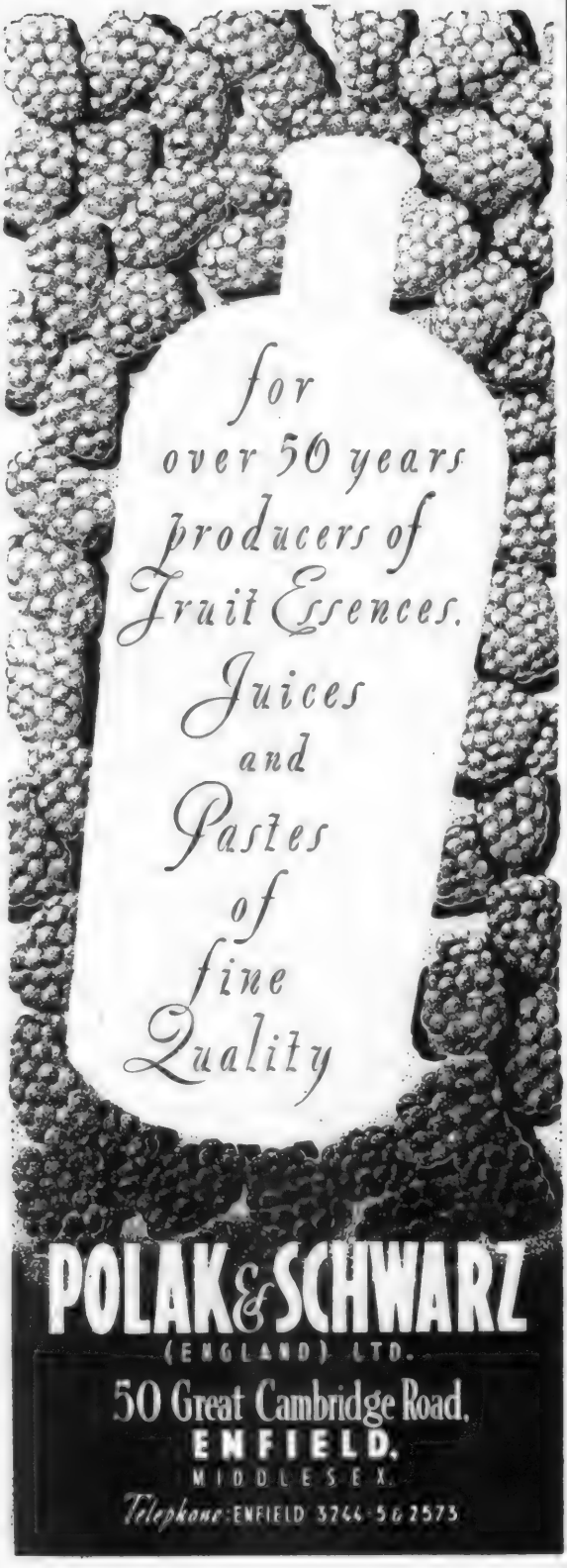

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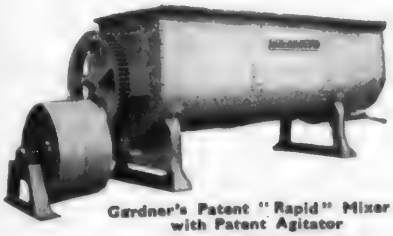
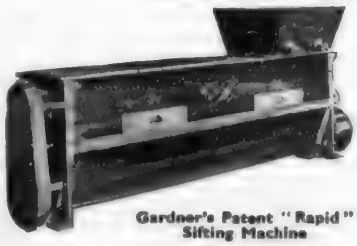
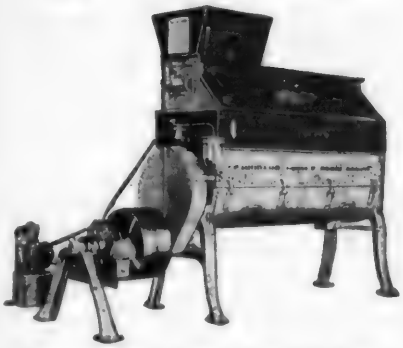


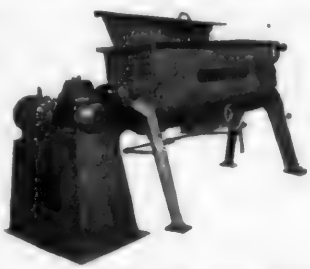
Gardner's Patent "Rapid" Mixer with Patent Agitator



Gardner's Patent "Rapid" Sifting Machine



Gardner's Patent "Rapid" Sifter and Mixer with Sprayer



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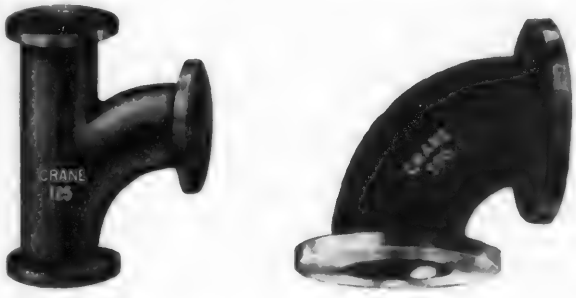

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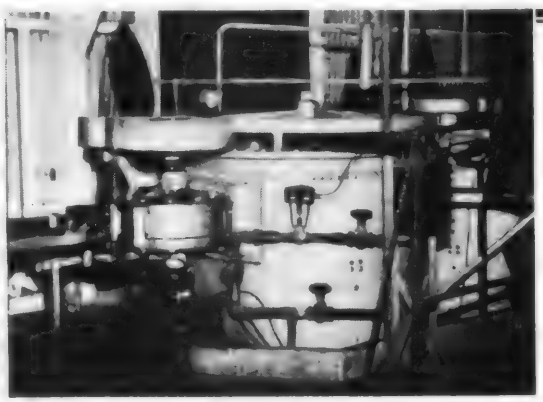

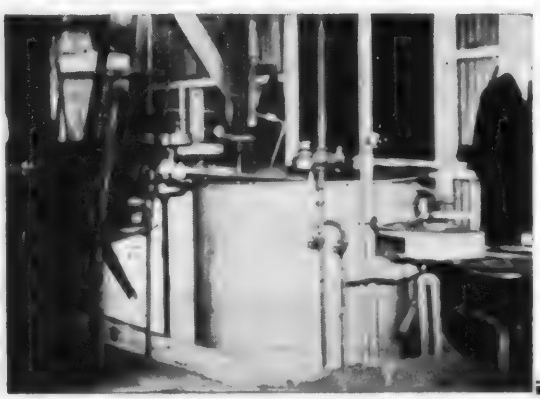

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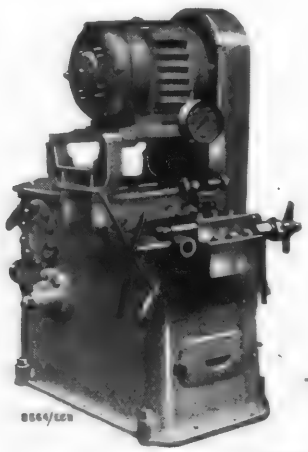

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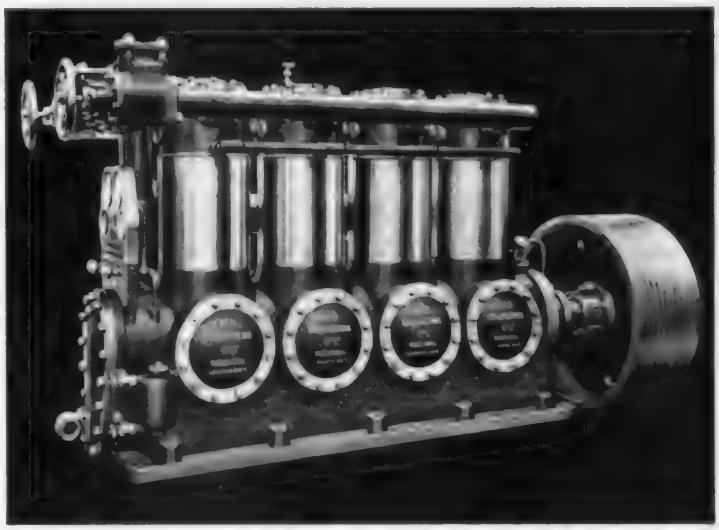

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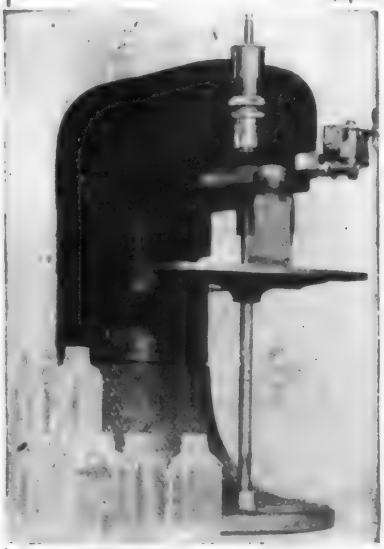

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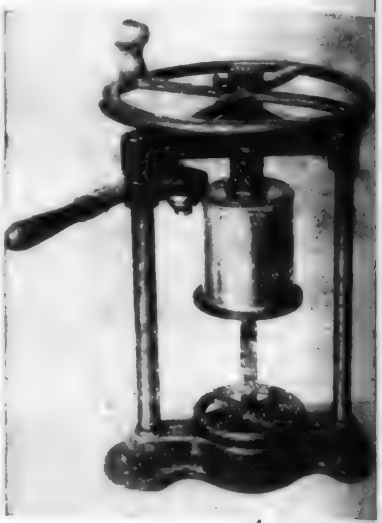

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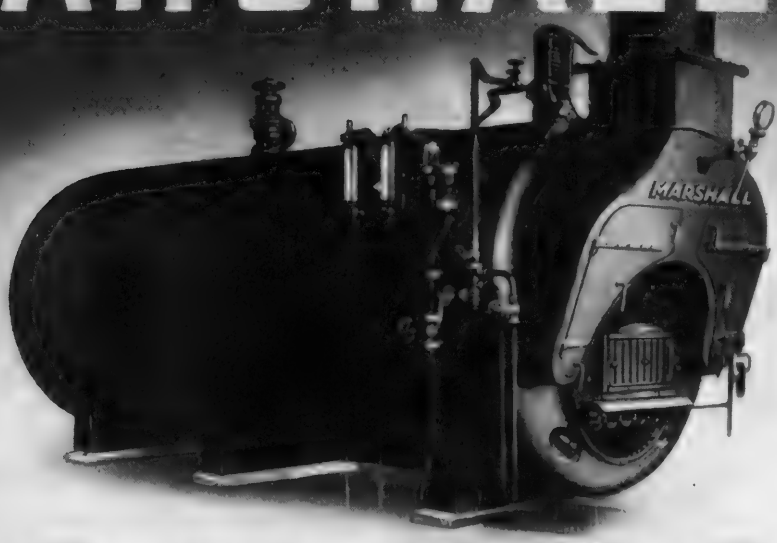

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FOOD MANUFACTURE

Vol. XVII. No. 9 · Published Monthly · September, 1942

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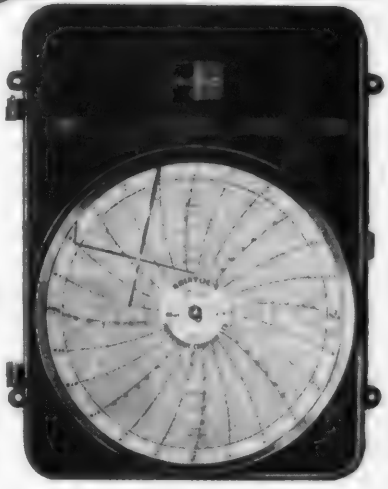

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FOOD MANUFACTURE

Vol. XVII, No. 9 September 1, 1942

Condensed Milk Pool

THE Ministry of Food is establishing a condensed milk pool, on which all the leading manufacturers and distributors will be represented. The pool will handle both home-produced and imported supplies of evaporated and sweetened condensed milk. Details of the scheme are not yet available, but it is expected that a limited company will be formed, on the lines of the Milk Powder Pool, to carry out the Ministry's policy in regard to condensed milk. Subscribers to the company would include representatives of the Ministry as well as of the leading manufacturers and primary distributors.

Two questions are engaging the attention of a number of firms in connection with the scheme. One is whether all firms will be required to sink their identity for "the duration". The other is whether manufacturers and importers will be permitted to advertise particular brands of condensed milk. At present the Ministry declines to give any information beyond the bare admission that the pool is in course of formation.

The Food Substitute Problem

An increasing volume of criticism of the Food Substitutes Control Order and its working is being made all over the country, and an epitome of its defects was presented at a recent meeting of the Health Committee of Leeds City Council. The Order laid down that, "except under and in accordance with the terms of a licence or other authority granted by or on behalf of the Minister, no person shall by way of trade or business engage in the manufacture of any food substitute".

The procedure is that applicants for a licence submit particulars of their product to the Ministry. The licence is, or is not, granted, but the reason for either of these alternatives has never been publicly explained.

Once having obtained his licence, the manufacturer proceeds to market his product. In due course a prosecution may ensue. This may arise from one of two causes: (1) That the manufacturer markets a product quite different in composition from that for which he has obtained his licence, (2) the Ministry has issued a licence for a worthless, if harmless, product.

The difficulty in which stipendiary magistrates are placed is evident by the remarks of one of them in a recent case. He said, "I am not going to fine people heavily for doing what the Ministry has encouraged them to do. Presumably the Ministry find out what are the contents of the products. If after that they license them, then it would be idle to prosecute people in this court. It would be an absurd position." On another occasion the magistrate asked, "Is the view seriously going to be taken that a product licensed by the Ministry could be a subject of a prosecution under the Food and Drugs Act? If it is, it is too ridiculous."

Yet Clause 5 of the Food Substitutes Control Order states that "a licence granted under this Order shall not operate to relieve the holder thereof of complying with the provisions of any Act, by-law, regulation or Order for the time being in force".

Some public analysts are asking why there is no disclosure of composition of licensed substitutes. Are public analysts more likely to take advantage of information than are members of the staff of the Government laboratory, or are the staff of the latter more competent as analysts?

The Ministry may have an answer to all this, and it would be very advisable that the position be cleared up. This would save magistrates, public analysts and manufacturers much worry and loss of time and money.

Concentration of Manufacture

Details have been given by a high official of the Ministry of Food of the progress made by that department in the concentration of food manufacturing industries. Action taken by the Ministry has resulted in the closing of

17 out of 22 processed cheese factories;
30 out of 40 compound lard factories;
18 out of 33 margarine factories; and
140 out of 200 edible fat-melting concerns.

These measures have effected large economies in factory space, labour and transport, and they have had no adverse effect on output, as the factories still in production are working nearer to their full capacity and include most of the larger factories.

Other concentration schemes planned by the Ministry and already in operation in varying degrees aim at the following reductions (shown in percentages) in the numbers of factories engaged:

Biscuits, 25; chocolates and sweets, 30; bacon, 30; soft drinks, 25.

The production of biscuits at the present time is greater than before the war. A large proportion of the output goes to the Forces.

It is perhaps only natural that the Ministry's methods should meet some criticism from some of the industries affected by concentration. In the case of bacon, for instance, the Ministry has been criticised for closing down a certain bacon factory in the Midlands and leaving the town in which it is situated without a slaughterhouse for pigs.

In some of the industries affected, particularly edible fats, manufacturers are concerned about the prospects of the post-war reopening of factories that are compulsorily closed down. At present the Ministry can give no information on this point except an assurance that the goodwill of every firm is being safeguarded. The Ministry's immediate task is to effect the concentration, and little consideration appears to have been given as yet to the equally important problem of post-war decentralisation.

Arsenic in Foods

In a recent case in which two firms were summoned for giving false warranties in respect of edible gelatine powder, some important points were raised. It was contended that no statutory standard for arsenic content of foods had been laid down, but the basis generally accepted was that of 1-100th of a grain per lb. recommended by a Royal Commission which investigated an epidemic of arsenical poisoning in 1903.

The samples in question contained 1/10th and 1/33rd of a grain per lb. The defence contended that before the powders were used as a foodstuff they were diluted to such an extent that the final food as eaten would contain less than 1/1000th and 1/300th of a grain respectively.

Dr. Roche Lynch, Senior Official Analyst to the Home Office, is reported to have given as his opinion that a safety maximum would be 1/10th of a grain.

In giving his deferred decision, the stipendiary found the defendants guilty of giving false warranties that the gelatines were "of the nature, substance, and quality demanded". He quoted cases heard in 1917, 1922 and 1928, in which a similar defence of "dilution" of the articles was not successful, and "after a careful reading of these findings he had come to the conclusion that the standard meant by the Commissioners was not the proportion of arsenic in a mixture but that in the substance which contained the arsenic in the first place".

The stipendiary agreed to state a case: (1) as to whether as a matter of law the warranties given by the defendant firms were false; (2) as to whether the standard laid down by the Royal Commission is a standard within the meaning of the Food and Drugs Acts.

It was also reported that the trade federation was taking the matter up with the Ministry of Health, and we hope that some clear-cut decision will be made.

The epidemic of 1903 produced considerable panic, and probably the standards recommended by the Commission were unduly stringent and need revision. The amount of arsenic (or any other poison) which may be safely left in foodstuffs is one to be decided by those competent to do so, uninfluenced by such a fantastic idea that because certain foods are scarce and cannot be obtained unless they contain a questionable amount of poison, the presence of such poison can be ignored in these days. After all, what is poisonous in peacetime is equally poisonous in wartime.

Bones

A recent broadcast announcement by the Ministry of Supply stated that if the 50,000 tons of waste bones still being thrown away, burnt or buried in Britain every year were salvaged, not one of the ships which now have to bring them 6,000 miles in the face of U-boat hazards need be used for the purpose.

It is stated that a chop bone weighing 2 ozs. will yield enough grease to make cordite to fire two shots from a Spitfire's guns, bonemeal to feed a hen for half a day, glue to stick a square foot of aeroplane fabric and sufficient fertiliser for a square yard of land. In a recent leader, *The Meat Trades Journal*, while commending the foregoing points to the attention of their readers, at the same time commends them to the attention of the Ministry of Food, as there seems little point in sending meat "boneless" to save shipping and then using shipping to send the bones. If the bones came in the carcase in the normal way an appreciable wastage in meat would be saved and the bones could still be salvaged for war purposes.

We don't know who calculates such figures as those relating to the 2-oz. bone, but, if they haven't done it already, here is an opportunity of making some useful little comparisons between the space taken up by a carcase with bones in and that occupied by the same carcase with bones removed, plus rendered fat, plus finished bonemeal, plus glue, plus fertiliser.

Quality of the National Loaf

The ash content has hitherto been widely used as the criterion in milling studies on flour, but it is not satisfactory for application to national flour, since the ash content of the germ, aleurone layer and bran are all high and differ but slightly and they therefore give no information as to whether the flour contains the undesirable bran or the

highly nutritious fine weatings and germ; furthermore, it could not be applied to bread. The crude fibre content is a better criterion and was used in a survey by G. N. Jenkins, E. I. McDougall and P. Herbert (*Lancet*, July 18), the aim of which was to gain some idea of how far the fibre content of the national loaf, as sold, conformed with the recommendation of an upper limit of 0·9 per cent., on a 15 per cent. moisture basis, for the national flour.

Methods of analysis are given, and of seventeen samples examined the values for ten were within the crude-fibre limit recommended by the Medical Research Council, five were slightly above and two exceeded it by a large amount. These results, although obtained on bread and by a different method, agree in the main with the survey of flour made by the Research Association of British Flour Millers, who found that the crude-fibre content of forty-seven out of three hundred and three samples exceeded 0·9 per cent. Thus shortly before the national loaf became compulsory a small but far from negligible proportion of millers were supplying a product which did not achieve the Medical Research Council's aim of supplying the maximum nutritive value and palatability with the minimum amount of coarse material liable to cause digestive troubles. The authors are of the opinion that a check on the quality of the national loaf should be in constant operation, though this will be inapplicable while it is permitted to use up to 25 per cent. white flour with the national flour.

American Candy Making

British confectioners will have a fellow feeling for their opposite numbers across the herring pond on reading a talk given in New York at the Candy Executives' Club last March. James A. King stated that "the impact of this war has struck the candy manufacturing industry with startling effect". He divided the industry into several groups according to the manner in which they are facing the situation. There are the wise ones who have stocked up with raw materials while the going was good, although they have reduced the size or weight of their "bar" goods rather than reduce quality. Others are reducing quality and quantity while maintaining prices at, or slightly above, pre-war levels. The makers of widely advertised types of package candies and specialities are not changing either quality or quantity of materials (other than those which they cannot obtain at any price), as they prefer to do less business at higher prices rather than risk the loss of established consumer acceptance. Still another group will abandon the manufacture of standardised items rather than market a lower-grade product under the same brand name. The speaker rather naïvely suggested that one of the most important problems facing the candy-maker to-day is to adjust his formulæ so that he will secure the maximum poundage of candy per bag of sugar used.

Substitutes for refined granulated sugar include maple sugar and maple sugar syrup; honey; plastic invert sugar and invert sugar syrups; concentrated cane juice; refiners' syrup; high-grade molasses; sorghum syrup; corn sugar (dextrose); corn syrup (acid and enzyme); and maltose and malt syrup. If sugar scarcity is unduly prolonged, other sweeteners such as lactose; powdered whey; concentrated fruit juice syrup, such as pineapple and apple, and also sweet potato syrup will be more widely used.

The amount of sweetener that can be used to replace sugar in grained candies, such as short nougat, fondant centres and fudge is, of necessity, relatively small. On the other hand, all of the sugar used in nearly every kind of chewing candy may be replaced by one or more of the above-named sweetening agents providing, of course, that the candies are protected against humidity by wrapping, or coating with chocolate icing or fondant.

"Dehydrated" or "Dry"?

Having read about dehydrated foods, Mr. A. P. Herbert, in a letter to *The Times*, deplores the use of the "pompous, ludicrous, unwanted, mongrel word 'dehydrated'". He says that no one has yet suggested that "dehydrated" means anything but "dry", and protests against the daily letting loose of new Latin and Greek monsters among a bewildered people. Incidentally, those of us who are chemists and have been using the word for years and are now told that it is pompous, ludicrous, etc., will probably find themselves as surprised as the gentleman who was told that he had been talking prose all his life.

Webster defines "dehydrate" as: "To deprive or to be freed of water or the elements of water". He defines "To dry up" as "to become completely dry or dried". According to this there are degrees of dryness and a dry thing is not necessarily dehydrated, as in the phrase "the wind dries the earth". Mr. Herbert in his appeal for "dry" has unconsciously hit on the right word for the vegetables, as, if Webster's definition be accepted, they are not dehydrated, containing as they do 5 per cent. of water.

In any case it seems a pity that the lay press lifted the word "dehydrated" straight from the scientists and did not translate it for common use.

British Material for Export

Overseas readers are advised that the fact that goods made of raw materials in short supply owing to war conditions are advertised in FOOD MANUFACTURE should not be taken as an indication that they are necessarily available for export.

Industrial Uses of Potato Flour

A. BARKER B.Sc. (Agric.)
Farmers' Marketing and Supply Co., Ltd.

THE PRODUCTION of potato flour in England before the war was only in its experimental stages, and one plant only operated at Wisbech. The type of flour produced by this plant was of the uncooked variety, as described under another heading. On the Continent, however, the industry was highly organised, and particularly so in Germany and Poland, where considerable quantities of potato flour were used by the food industry every year. The policy in these countries has been the establishment of a large number of relatively small processing units in the potato-growing areas, thus saving transport and handling.

To this country, however, the shipment of potato flour was low, and the amount imported rarely exceeded 500 tons per annum. Furthermore, the price, which was the main reason for restriction, was relatively high by comparison with starch-rich products such as farina (potato starch) and maize starch. As England was the only free market in the world all the surplus starches from Europe, America and the East were attracted here. In consequence, these various starches were sold at prices considerably under the cost of production. This has been the main factor against the establishment of any industry in this country. Holland, for example, with its favourable geographical position and inland water transport, could always sell at below the cost of production over here. Without, therefore, a substantial tariff or Government subsidy, potato flour, under pre-war conditions, could not compete with imported foreign subsidised starches.

Present-Day Development

In addition to the one factory dehydrating potatoes at Wisbech, there have been, since the outbreak of war, put into operation a further four, and a fifth will be ready by next season. All of these factories are producing dried potato for the food industry, but even so the combined total is only sufficient to satisfy a relatively small part of present-day requirements. Every effort is being made, however, to increase the tonnage, as to-day hostilities have cut off supplies of a number of essential raw materials.

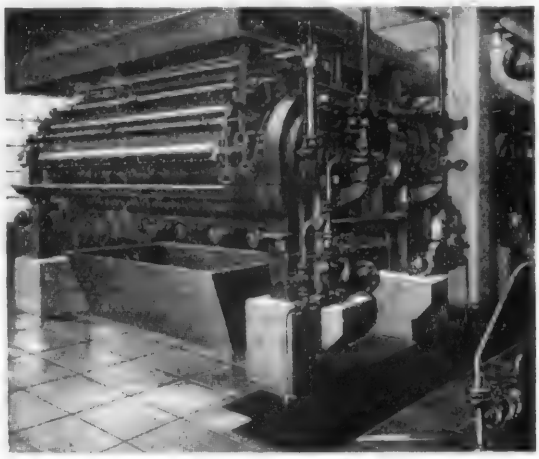


Fig. 1.—Type of Drier used in Potato-Flaking Factories.

In recent war years revolutionary changes have occurred in the food industry which have been brought about by the acute shortage of certain raw materials, and more particularly starch-rich products. This has necessitated the introduction of alternatives to take the place of those materials no longer available in normal quantities, and in many instances it has been found that the substitutes are superior to the substances they have replaced. In this direction it is worth recording that potato flour has now assumed a unique place in the industry which is of undoubted interest to all those associated with food production.

Manufacture of Potato Flour

The manufacture of potato flour is not quite as straightforward an operation as would be suggested by the statement that it is a product obtained by the elimination of water from potatoes by evaporation and the reduction of the dried material to a fine form by milling. The potato in its natural state contains a high percentage of moisture, in this country generally averaging 80 per cent., the balance of solids consisting of starch, protein, minerals and cellulose. In practice it is found that 5 tons are required to produce 1 ton of dried material. The process adopted in the main units operated is as follows:

1. *Cooked Potato Flour—ex-Flaking Units.*—The potatoes are thoroughly washed to remove adhering dirt and soil and then conveyed to a steamer, where they are treated under a steam pressure of 10 lbs. for 25-30 minutes. After this treatment they are transferred to a mashing worm and then distributed over the surface of a steam-heated rotating cylinder. By means of rollers the mash is spread into a thin film, which by close contact with the hot metal surface of the cylinder rapidly loses its water. This dry film is scraped off by means of knives—the dried potato at this stage being known as potato flakes. It is from these flakes that *cooked potato flour,* as distributed to the food trade, is prepared.

2. *Uncooked Potato Flour—ex-Band Units.*—The potatoes are thoroughly washed as in the previous drying method, but after this stage they receive no steaming or cooking process, being merely cut into slices before entering the drying chamber. This consists of a tunnel 73′ × 7′, through which passes a continuous perforated metal band. On to this band the slices, which have had a further washing after cutting, are fed at the approximate rate of 2 tons per hour. From wet to dry end of the tunnel the potatoes are reduced from 80 per cent. moisture to 10 per cent. in the space of 40 minutes, the temperature used ranging from 240° F. at the start to 210° F. at the finish. Like the potato flakes, the dried slices are milled into fine flour.

Cooked Potato Flour as an Improver

The early research into the possibilities of using potato flour was carried out entirely from the point of view of its incorporation in bread mixtures. It had for many years been quite a common practice for bakers to use fresh mashed potatoes as an improver in their mixtures, and on this basis it was ascertained, after numerous experiments had been carried out, that up to 10 per cent. potato flour doubled the life of the loaf, increased the yield and imparted an improved flavour to the crust. Under present manufacturing arrangements, where a proportion of the peel is retained in the flour, and only National brown bread is baked, the problem of darkening in the loaf does not arise. Where peel is retained in the flour the colour of white bread does, however, become " greyish ", although the complete elimination of peel prior to drying overcomes this. As yet, although the production level of potato flour in this country does not permit even the addition of 0·05 per cent. potato flour in a National standard bread mixture, it can, if incorporated in speciality products, be used with considerable advantage. There is no doubt that one of the consumers' greatest problems with bread is its rapid " staling ", and it would appear, therefore, desirable in the national interest to encourage the use of products, such as potato flour, which will assist in solving this.

Bacteriological Aspect

A problem which has received attention during the past twelve months in connection with potato flour in bread or other wheaten products, is the danger of introducing a material which might, under some conditions, accelerate the development of " rope ". It is true that potato flour manufactured from potatoes which have received no special peeling treatment does contain numbers of " rope " organisms (*B. mesentericus*). These can only be eliminated by complete removal of the peel, which is undoubtedly a costly and wasteful procedure, giving rise to raw material losses as high as 20 per cent. It is extremely doubtful if this is justified under present-day conditions or until such time as production capacity permits the general introduction of potato flour to the baking industry as a whole and in large amounts. In the meantime, it is fully established that peel content in the flour and *B. mesentericus* spore counts are closely related, and the suppression of the latter is dependent on the elimination of the former. Where the content of potato flour in the loaf is low—for example, in the order of 5 per cent.—the danger of an increased rate of rope formation is negligible. Furthermore, commercially, as distinct from controlled laboratory conditions, it presents no greater a problem than that formally experienced when using N.S.R. or National wheatmeal flour.

Uncooked Potato Flour as a "Duster"

In the handling and rolling of doughs in the bakery one of the problems to be overcome is that of sticking to wood or metal surfaces. Hitherto it has been normal practice to use as " dusters "—*i.e.*, anti-sticking agents to prevent adhesion to boards, etc.—such materials as rice cones and ordinary wheat flour. Before the war the question of using potato flour (of a special type) for such purposes was thoroughly investigated by the manufacturers and, as a result, it was found that it possessed several advantages over those products in common use. For example, the quantity of dusting agent generally used per sack (280 lbs.) of flour varies between 5 and 7 lbs., according to the type of dough—*i.e.*, some doughs are stiffer than others. Furthermore, as wheat becomes rarer, the flour mix is weaker and more enzymic, making up into stickier doughs, and consequently up to 10 lbs. per sack might have to be used. Over a series of tests, using potato flour in place of these agents, it was found that only half the usual amounts were needed; thus, 4 lbs. potato flour will do the work of 8 lbs. wheat flour or " cones ". Furthermore, compared with the other dusters, potato flour has better filming properties and

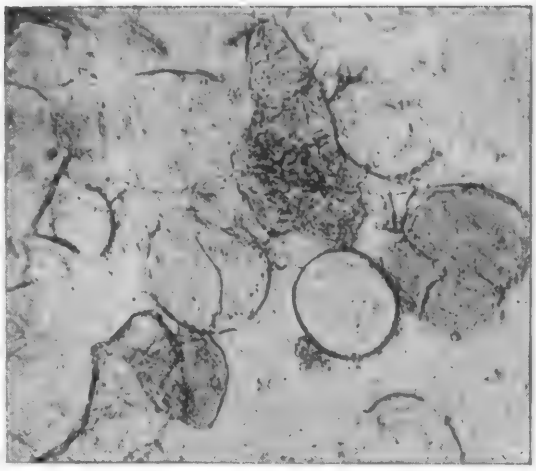


Photo by F. D. Armitage.

Fig. 2.—Cooked Potato Flour × 66, with Peel.

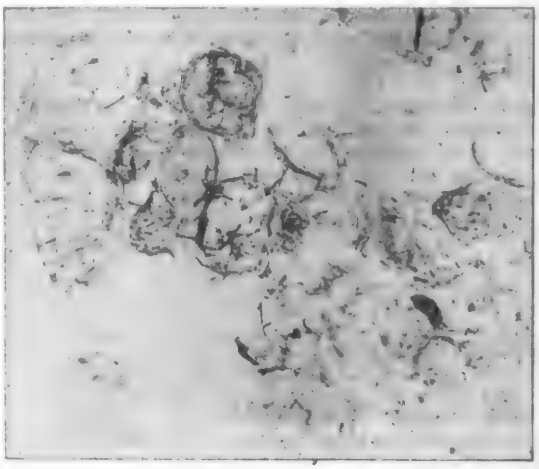


Photo by F. D. Armitage.

Fig. 3.—Cooked Potato Flour × 66, without Peel.

It will be seen that under magnification the starch cells in cooked potato flour are swollen and, in many cases, ruptured. This is particularly noticeable in Fig. 3.

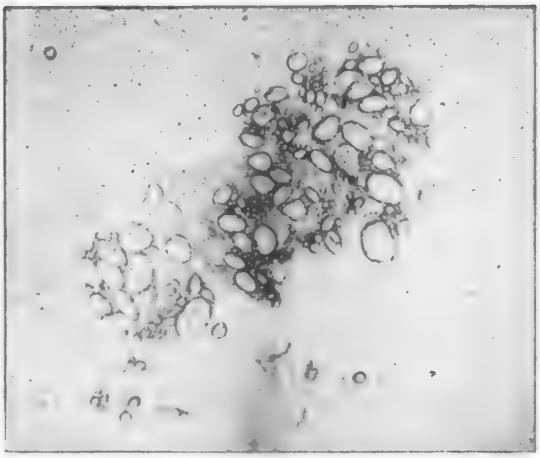


Photo by F. D. Armitage.

Fig. 4.—Uncooked Potato Flour × 66.

In this photograph the type of flour obtained by drying the raw potato is well illustrated. By comparison with cooked flour, the starch grains are intact and of normal size.

imparts a more favourable crust to the loaf. Practical experience has shown that the optimum amount to use per sack of flour is 4 lbs. of potato flour.

To-day potato flour is being used extensively for dusting purposes in War Dept. bakeries throughout the country with entirely satisfactory results. In both the hand and mechanical bakeries it acts with equal efficiency.

It should be noted that the type of flour used for this purpose is known as "uncooked", inasmuch as the drying process is as described under heading (2). This system of drying gives a final product which is less soluble and with low water-absorbing properties.

Other Uses for Potato Flour

Apart from the baking industry, in which the use of potato flour has been discussed above, it is now being incorporated in many products which find their way on to the market in a proprietary form; soup powders, for example, lend themselves particularly to the incorporation of cooked potato flour on account of its ability to cause thickening and, at the same time, act as a filler. Furthermore, it can be regarded as a fairly neutral carrier for more highly flavoured commodities such as powdered carrot, turnip, parsnip, onion, celery, etc. Abroad, and more particularly on the Continent, this fact was clearly recognised many years ago, and one European country supplied its army with a soup mixture consisting of 95 per cent. potato flour, the balance being onion and salt.

For sauce-making, cooked potato flour is a satisfactory thickening agent, and is to-day being used in considerable quantities for such purposes. It is interesting that on roasting the cooked flour a fine golden-coloured, free-running powder is obtained which, on mixing with water, assumes the appearance of a thick dark-brown gravy. Mixed, therefore, with meat extract or other similar substances, potato flour can be the basis of many types of attractive sauce and gravy preparations.

In the confectionery trade there are many uses to which potato flour can be put, and already it has been incorporated in considerable quantities in cocoa preparations for liquid consumption. The amounts used have been as high as 20 per cent. When used in this manner, it serves the function of keeping the cocoa in suspension after water is added. At the same time, it can also be used as a chocolate filler—for example, as in the preparation of slab chocolate.

In view of the high starch content of potato flour, it is not surprising that a use has been found for it in heavy industries, and as a core gum it is to-day in regular use for the casting of aeroplane and bomb parts. Mixed with foundry sand it has been found, when modified by chemical treatment, an excellent binding agent for cores in this type of moulding work. A limited supply of cereal starches has also fostered investigation into the possibilities of using potato flour as a base for certain types of adhesives. It has already been established that labelling pastes and sizing gums can readily be prepared after treatment of the flour with alkalis and other chemical reagents. Recent work has shown that envelope and bag seams can be securely closed with potato flour adhesive, and cardboard can be built up with equal facility. In the preparation of tubes, such as would be used for shell cases and cartridges, laboratory work proved that the flour can replace the more generally used starch products such as manioc and rye flour. Under present-day conditions, where importation of goods requires to be restricted to a minimum, this is undoubtedly of considerable value and importance.

From the above outline of the many varied uses to which potato flour is to-day being put, it is evident there is still considerable room for its further development in other directions.

Two Films about Tin

CORNISH tin mines, long derelict and almost forgotten, have become the scene of activity, and many of them are now in full production.

Two new films, produced by British Foundation Pictures, show the many stages in the production of the finished tinplate from the ore, and from the tinplate to the finished cans.

A point of interest at the present time is the new type of container known as the "black can"; this wartime pack will become commonplace in the near future in the packing of coffee, cocoa, dried milk, and is, even now, familiar as the new "dried egg" pack. Although this pack is just as valuable as its peacetime counterpart so far as reclamation is concerned, only a slight tin-content is used in its manufacture, and the whole effect is that of a very light pewter.

The second film shows the wartime activities of a large tin box company against the background of the same company's productions in peacetime: the highly polished tobacco tin becomes a tin for anti-gas ointment; the fancy biscuit tin becomes a soldier's billy-can; other ornamental tins become other army cooking utensils; talcum powder tins become incendiary bomb containers; and certain machines which were turning out attractive caramel tins are now making the metal part of the Service respirator.

The Future of the Creameries

"Cheese and butter manufacture in this country will never again be what they were." This grave statement, made by Professor H. D. Kay, O.B.E., Ph.D., D.Sc., Director of the National Institute for Research in Dairying, in reply to a question at a meeting of the Royal Society of Arts, London, raises the question of the post-war position of the whole of the British creamery industry.

CLIFFORD SKERTCHLY.

PROFESSOR Kay's words have a solid foundation, and their seriousness is emphasised by the fact that butter and cheese absorbed approximately 51 per cent. of the total pre-war gallonage of milk utilised for manufacturing purposes in England and Wales.

The Pre-War Position

At the outbreak of war the number of creameries licensed by the Milk Marketing Board was approximately 550. The North-Western Region had the largest number, the Mid-Western Region being second in importance. The Milk Marketing Board had for some years refrained from licensing new creameries in the South-Eastern Region because of the predominating importance of London's liquid market as an outlet for the entire production of milk in these counties. Obviously if more milk were used for manufacture in Kent, Surrey or Sussex, a still greater volume of supplies would have to be brought to London from distant counties.

During the 1938-39 contract year, which ended on September 30, 1939, the quantity of milk used for manufacturing purposes in England and Wales was 331,111,877 gallons. The following figures supplied by the Ministry of Agriculture show the utilisation of this milk in the production of the various commodities and also the average prices paid to the Milk Marketing Board for the gallonages so used:

	Gallons.	*Price per Gallon (in pence).*
Butter (Cornish) ...	12,532,409	6·03
Butter (other counties)	88,784,543	5·50
Cheddar cheese ...	20,290,707	5·11
Other hard cheese ...	41,805,047	5·58
Stilton	4,208,213	6·42
Soft cheese	1,041,127	8·50
Condensed milk ...	73,046,065	7·51
Ditto, for export ...	7,848,920	6·03
Milk powder ...	17,218,198	7·00
Fresh cream	48,998,621	8·34
Tinned cream ...	10,498,444	7·50
Bottled cream ...	517,233	8·50
Ice cream	890,365	8·70
Other products ...	3,422,985	10·20
Total	331,111,877	6·60 average.

These figures show that the principal milk manufacturers, in order of importance from the standpoint of milk utilisation, were:

Butter	101,316,952	gallons.
Condensed milk	80,894,985	,,
Cheese	67,354,094	,,
Cream	60,004,298	,,

The Board found a market for every gallon of milk produced, and although creameries had to sell their products in the teeth of fierce world competition, the prices the Board received for factory milk were much nearer to the cost of milk production than was usually recognised. By far the largest part of the 331 million gallons was utilised for manufacture during the summer months, when the cost of milk production is always lowest. The average prices of about 8¼d. per gallon for milk manufactured into cream, 7¾d. for condensed milk, and 7d. for milk powder were not much below summer production costs on many farms, while the small quantity used for chocolate and other special lines fetched a very useful profit to the Board.

Post-War Prospects

Those days have gone—never to return. The changes brought about by war conditions cannot be revoked in their entirety, but unfortunately it is more difficult to see in the post-war reconstruction an era of prosperity for Britain's creameries than it is for a number of other industries.

The outlook for the future of our creameries will be more clearly understood by first examining the changes brought about by war conditions.

No creamery can exist without milk to provide its through-put, and milk manufacturers can never expect more than the overflow from the liquid market with which to feed their machinery.

Before the war the liquid market absorbed 68 per cent. of the total output of milk in England and Wales, leaving 32 per cent. for the use of the creameries. During 1941-42 the liquid market absorbed no less than 90 per cent. of the total production of milk, leaving only 10 per cent. for the creameries. On the basis of pre-war milk production this would mean a total of only 120,000,000 gallons a year (or about one-third of the pre-war quantity) for manufacture. But as milk production is known to have been below the pre-war level, the quantity available for the creameries was even less.

Increased Liquid Milk Demand

This drastic restriction of milk manufacture has been necessitated more by the increased demand for liquid milk than by the fall in production. Demand for liquid milk now exceeds the supply throughout the winter, and except for the fulfilment of Government contracts, the country's creameries have been virtually closed from October to March, both in 1940-41 and in 1941-42. This will no doubt continue for the duration of war.

The steady expansion in the demand for liquid milk continues to have a telling effect on the supply available

for manufacture in summer, and the manufacturing schedule drawn up by the Ministry of Food at the beginning of the present season is but the shadow of the pre-war manufacturing programme. In view of the shortage of man-power and the necessity for economising in fuel, factory space and so on, it is not surprising that the Ministry decided to close down 126 establishments all the year round. They comprise 85 cheese factories, 7 butter factories, 4 roller-process dried milk factories and 30 milk salvage plants. The position of the creamery industry is expected to become still more serious during the remainder of the war.

When Peace Comes ?

When peace comes, what then? The creamery industry will *not* be able to say that its trials and tribulations are over. Far from it. Although provision has been made for the reopening of the 126 closed factories after the conclusion of hostilities, many members of the industry fear that several of these establishments may never do so.

Milk production will continue to be a major operation in Britain's post-war farming—but only because of the liquid market. As it is uneconomic to import liquid milk, this market will continue to be a monopoly of the British farmers. Restriction on the quantity of milk the public may buy is unthinkable in time of peace. Moreover, the National Milk Scheme, under which mothers and infants may receive milk either free of charge or at 2d. a pint, has been introduced as a *permanent* measure, and not for the duration of war. Present restriction on the supply of milk to factory workers will be removed, and the National Milk Publicity Council will come out of "cold storage" to resume its "drink more milk" campaign. Nor will the milk-mindedness of the public pass with the signing of the peace treaty.

In view of these facts, is any decline to be expected in the post-war demand for liquid milk? Or is it more likely that the removal of restrictions on the consuming public will increase still further the demand for liquid supplies? Many members of the milk industry believe further expansion in demand to be the more likely.

Mr. J. L. Davies, Assistant General Manager of the Milk Marketing Board, and Milk Production Officer of the Ministry of Agriculture, has stated that the present demand for liquid milk is in excess of the pre-war winter production. It seems highly probable, therefore, that the virtual suspension of the milk manufacturing industry in winter will continue after the war, and that the summer "surplus" available for manufacture will be materially less than was available in the pre-war flush season.

Equalising Summer and Winter Milk Production

Another tendency now at work will hamper manufacturers after the war. This is the effort made by farmers to arrange their calvings so as to minimise the difference between summer and winter milk production. Dairy farmers realise that if there were no such seasonal difference in production their unremunerative manufacturing market would be very small indeed. It is therefore in the farmers' interest to equalise summer and winter milk production as much as possible, although they know that every change from a spring to an autumn calving means another nail in the coffin of the creamery proprietors.

There will be room in the post-war period for expansion of milk production far beyond the pre-war output, in order to supply the liquid market alone. In fact, Professor Kay has estimated that the present national herd of 3,200,000 cows could be increased to 4,500,000 to supply the potential demand for liquid milk.

Importance of "Manufacturing Milk"

All too seldom does one hear anyone in authority speak of the importance of milk for manufacturing purposes. Utterances in regard to manufacture are usually of a reverse nature. We are told, for example, that it is useless to manufacture butter on a large scale in this country because it can be done so much more cheaply in New Zealand, where grass grows all the year round. One never hears the quality of Cornish creamery butter attributed to the fact that grass grows for nine months of the year in that county.

We are told, similarly, that cheese cannot be manufactured in this country at prices that permit payment to the farmer of at least his cost of milk production, and that manufacture of this product, too, can best be left to the Dominions and foreign countries.

Full-cream condensed milk was one of the very few manufactured milk products in which British creameries held a dominating position in their own market. Most of the condensed skim milk on the market was imported.

Total Capacity of Creameries

The 331 million gallons of milk manufactured in 1938-39 did not represent the total capacity of the creameries. During the early years of the milk marketing scheme the Board insisted on certain creameries extending their premises as a condition for obtaining supplies of milk. Manufacturers were thus committed to an expenditure totalling tens of thousands of pounds. Very soon producers learned that every gallon of milk produced in excess of liquid requirements tended to reduce their pool price, and although under war conditions guaranteed pool prices have lifted the burden of the manufacturing market from the producers' shoulders, no sign has yet been given to suggest that this burden will not be reimposed when normal trading is commenced after the war.

A "safety margin" of 20 per cent. over liquid requirements was formerly considered by the Board to be necessary, and a 20 per cent. margin in winter involved a much wider margin in summer. Hence the reasonably large quantity available for manufacture during the season. As already explained, not even a 2 per cent. margin in winter can at present be foreseen for the post-war era, and the summer surplus threatens to be but a fraction of the pre-war gallonage.

Is it likely, then, that the 126 creameries at present closed will wish to reopen after the war? It is doubtful whether all will care to do so.

Effects of Milk Testing Scheme

Creameries will also be affected by the quality milk testing scheme, though the precise post-war effect has yet to be determined. In theory, only milk of salvage quality will be used for manufacture, but this principle may be difficult to carry out in practice under ordinary trading conditions. Nevertheless, the fact remains that the aim of the scheme will be to reduce the potential gallonage available for manufacture as the average

standard of the nation's milk improves, and that the ultimate goal is to produce all milk for the liquid markets and none for manufacture.

Everything points to a pronounced shortage of milk, from the manufacturers' point of view, for several years after the war. Farmers will be able to market something like 90 per cent. of the total production in the liquid market, and, as the Milk Marketing Board has a factory in nearly every region, the Board will itself be a large buyer of whatever surplus may be available for manufacture.

Creamery proprietors are faced with a post-war prospect that the costly factory extensions which they carried out at the Board's request may become white elephants.

No Post-War Millennium for Creameries

Much is said about a "square deal" for British agriculture after the war, but seldom is the creamery industry linked with agriculture in this connection. The difficulty experienced by the National Association of Creamery Proprietors and the Milk Board combined in trying to induce the Import Duties Advisory Commission to take any action in regard to tariffs on imports of milk products is still fresh in our minds.

It is already certain that there will be no post-war millennium for creameries in this direction. The Government has already made it clear that our Allies will have a voice in Britain's post-war trade policy. This means that the Dominions, Norway, Poland, Russia, the United States of America will all have voices in framing that policy. While it is highly desirable that the United Nations should be allies in peace as well as in war, there seems to be a very real danger that the voice of the British creameries may be drowned in the chorus of lower-priced countries overseas.

The Oxidation of Starch

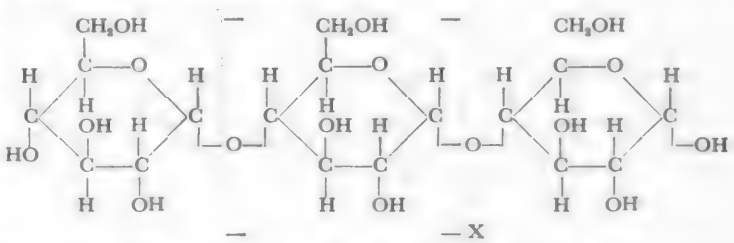
At the present time manufacturers are more concerned to be able to get starch for use than consider new applications or to embark upon new methods of modification, but the fact remains that after the war the demand for modified starches will not only reach pre-war levels but probably greatly exceed it. It is therefore intended to review the various methods by which starches in general can be modified by oxidation and to give a fairly comprehensive list of references to the subject to enable manufacturers and users to see what has been accomplished in this field.

J. A. RADLEY, M.Sc., F.I.C.

WHEN starch has been oxidised to a sufficient degree the product is soluble in hot water, giving mobile solutions which contain a high proportion of starch. Although films produced from such solutions have a somewhat lower tensile strength than those from unmodified starch they possess certain advantages, such as transparency and power of penetration, that make them of great value in the paper, adhesive and textile trades. The soluble starches made by oxidation are, in general, whiter in colour than those made by the action of acid on starch, and have the great additional advantage of limited "setting up", or thickening on standing, which is shown in the much esteemed high-grade tapioca starch and dextrines. The oxidation of starch decreases the amount which can retrograde, or precipitate, on ageing and thus provides products giving permanently clear solutions; starches which give solutions which become thicker or thinner in consistency or become cloudy are undesirable for a number of purposes.

The transparency and greater penetration of oxidised starches are important in the textile and paper industries;[183] the ability to obtain free flowing starch solutions having "tackiness" and a high solid content is of importance in the adhesive trade,[47] where too much water present causes paper to pucker and a slowness in drying which results in unsatisfactory work and a slowing down of production respectively. In "clear-gum" confectionery an oxidised starch is demanded which will not become cloudy on storage due to retrogradation and which will replace the more expensive gum senegal now used. Oxidised starch can be used wherever an inert, soluble diluent is required—for example, in the standardising of dyestuffs and as a diluent for insecticides, fungicides, etc. In the latter cases the adhesive properties of the starch are of value in helping in retaining the active agent on the surface to which it is applied. Its use in the food industry has not, perhaps, been as fully exploited as it might have been. Its comparative cheapness, inert and colloidal properties did much to recommend its increasing use every year in the pre-war period, and no doubt after the war it will regain the prominence to which it was then moving.

It is generally agreed that starch consists largely of chains of α-glucopyranose units joined by 1-4 linkages as follows:



It will be seen that the site of attack of an oxidising agent is not very limited, and that there are terminal aldehydic groups, primary alcoholic groups and secondary alcoholic groups available for oxidation.

Fig. 1.—Potato starch, shown above, is generally modified by acid treatment.

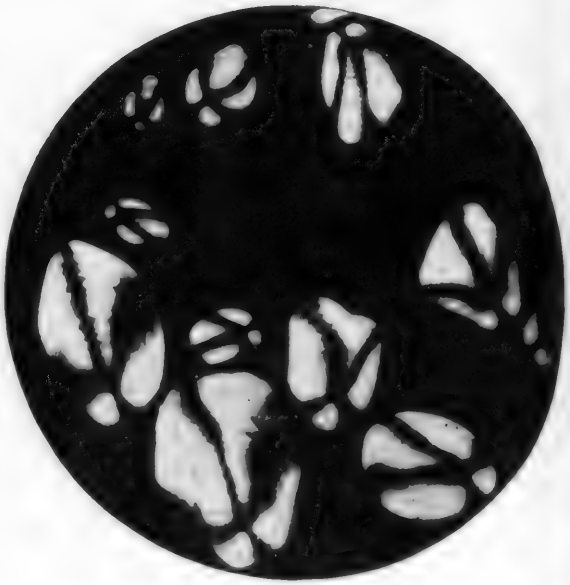


Fig. 2.—Photomicrograph of potato starch (same field as photograph on left) taken in polarised light.

The priority which one or the other of these groups may enjoy in the initial stage of starch oxidation has been the subject of much speculation.

Among the large number of papers on the oxidation of starch only a few have contributed substantially to the study of the mechanism of the oxidation, as the oxidations were either too mild or too extensive to throw light on the intermediate stages. Many workers have examined the physical properties of the slightly oxidised starches or the end products of extensive oxidation only, but relatively little work has been done on the intermediates. However, the mechanism of the periodic acid oxidation has been greatly clarified by Jackson and Hudson[120, 124] and Caldwell and Hixon.[28]

In order that satisfactory comparisons may be made among the oxidising agents used on starch, the oxidants should be compared on an equivalent basis rather than on a weight basis and expressed as the number of equivalents for each glucose anhydride ($C_6H_{10}O_5$) unit. For example, two equivalents of chlorine per glucose unit would mean 70 grams of active chlorine per 162 grams of starch. This system shows the error in many comparisons which have been made in the literature on a weight basis and makes possible a fundamental comparison of all oxidising agents in the laboratory attached to the factory.

Although the hydrolysis by acid has been far more important to commerce and research than has the oxidation of starch, the hydrolysis of starch to glucose was not discovered by Kirchhoff[127] until twenty years after starch had been oxidised by Fourcroy[66] in 1792, using concentrated nitric acid and later chlorine gas.

Starch has been oxidised in acid, alkaline and neutral solutions and the course of the oxidation depends to a large extent on the *p*H of the medium.

1. OXIDATION OF STARCH IN ACID MEDIA

In an acid medium hydrolysis of starch occurs along with oxidation, giving, therefore, oxidised forms of the hydrolytic products of starch.

Oxidation by Nitric Acid

Nitric acid at concentrations over 0·6 N produce oxidation.[44] Stronger nitric acid solutions oxidise starch to saccharin, tartaric and oxalic acids, and carbon dioxide.[66, 72, 88, 96, 135, 143, 176, 212]

By using concentrated nitric acid Bechamp[6] produced oxidised starches of varying solubility in cold water. Oxidised starch containing nitrogen was obtained by a number of workers when the oxidation was carried out by concentrated nitric acid, and the nitrates of starch so produced have been dealt with by the author elsewhere.[183]

Beaconnot[17] made a product soluble in cold water, and Pelouse[177] suggested, because of its combustibility and its resemblance to guncotton, that nitrostarch should be used as an explosive. Starch nitrate for this purpose has been produced commercially in the U.S.A., and it is important that the starch thus employed should be quite free from fatty or oily material. The use of nitric acid in dextrine manufacture is widespread, but in this case it is used as a hydrolytic agent[183] and not as an oxidising agent, although, no doubt, some oxidation does take place. Some nine patents have been taken out on the oxidation of starch with nitric acid, [52, 115, 12, 153, 158, 162, 166, 167, 216] but six have lapsed and none are English applications.

The decomposition of ammonium nitrate is accelerated by the presence of starch and there is evidence of oxidation of the starch. This compound, among others,

Fig. 3.—Sago starch: bath acid and oxidising treatments are used to obtain soluble modification of this starch.

Fig. 4.—Photomicrograph of sago starch taken in polarised light.

is mentioned in another patent for the oxidation of starch, but is unimportant.

Oxidation by Chromic Acid

Chromic acid acting on starch under mild conditions can bring about a small amount of oxidation. Starch thus treated yields "soluble starch" [43, 105, 198, 201, 209] or dextrines.[49, 113, 143] Reychler's[198] oxidised starch, though insoluble in hot water, dissolved readily in very dilute alkali. Jambuserwala[125-127] showed that potassium dichromate/sulphuric acid treatment of starch affects the reducing value of starch about three times as much as a hypochlorite solution of equivalent oxygen content, and that the process requires careful control if the starch is not to be degraded to an unusable extent for textile work. If the reducing power is taken as a criterion of degradation then farina is the most readily oxidised, followed by sago, wheat and maize starches in order of decreasing sensitivity. This worker reports a gradual increase of acidity during oxidation and other workers have also noted the acidic properties of these chromic acid products.[192, 140]

Cross and co-workers[33] reported a yield of 10% furfural when starch was oxidised in the cold by six equivalents of chromic acid coming, it is presumed by Farley,[52A, 183] from polyglucuronic acids. Furfural was evolved, however, by the action of alkaline permanganate pointing to the presence of uronic acid. It seems probable that heating of the chromic acid solution caused destruction of the polyglucuronic acids.[52A] Large amounts of formaldehyde have been obtained also.[206]

The oxidised starches made with chromic acid may be used in certain classes of textile work and for paper sizing, but its use in foodstuffs is not recommended owing to the tenacity with which the starch retains small amounts of chromium. These starches could also be used in adhesives, but for this type of work modification by hydrogen peroxide or sodium hypochlorite is preferred (see below).

The determination of cellulose quantitatively by complete oxidation with chromic acid was established by 1929, and Richardson and co-workers[192] successfully applied the method to starch by boiling in a sulphuric acid and potassium dichromate mixture followed by titration of excess dichromate with ferrous ammonium sulphate, the amount of starch being calculated from the equivalents of dichromate used for oxidation (see also Ref. 144).

The chromic acid treatment of starch has been patented,[161, 191] but these patents have by now lapsed.

Oxidation by Permanganates

Early workers carried out this oxidation to excess,[141, 143] but mild oxidation yields soluble starches.[160, 192, 240] The use of acidic permanganates on starch has been patented.[128, 161, 191] It should be noted that starches treated in this manner retain manganese tenaciously and require, generally, an after-treatment with sodium hydrosulphite or oxalic acid to remove the last traces of this metal, which imparts a yellowish colour to the soluble starch. Such starches have been used for textile sizing and for paper sizing and coating.

Oxidation by Hydrogen Peroxide

The action of hydrogen peroxide on starch has been studied by more workers than that of any other oxidising agent.[4, 14, 21, 30, 46, 58, 77, 78, 79, 80, 85, 86, 87, 105, 106, 107,

[165, 167, 168, 195, 196, 213, 220, 242] Hydrogen peroxide alone, according to Wurster,[213] hardly attacks starch at ordinary temperatures, but in boiling acid solution produces dextrines and glucose.

As with other agents the amount of hydrogen peroxide used, its concentration, time of action and the temperature at which the reaction is carried out, all influence the character of the final product, so that these can range from but slightly changed starch down to that giving thin, mobile solutions at high concentration, giving transparent but tough films on drying.

Gerber [79, 80] claimed to have simulated an amylolytic hydrolysis of starch by using very dilute hydrogen peroxide (0·1% and less), dextrines and maltose being formed; the latter, however, was oxidised when large amounts of peroxide were used. Omori[167] considers that the action of hydrogen peroxide on starch is governed by a mechanism different from that of diastasis.

A number of workers have sought accelerators for solubilising starch by means of hydrogen peroxide.[58, 48, 14, 167, 168]

After finding that colloidal iron had no effect on the rate of oxidation, Durrieux[48] used ferric chloride and iron, and copper salts have also been used,[14] whilst Omori[167] claims that hydroxyphenol is a better catalyst than the heavy metal ions. Omori finds that the combination of iron salt and hydrogen peroxide on starch has a more effective modifying power when cystine, tyrosine, glutathione or thioglycollic acid is added. It has been found that 69·6% of the original starch is oxidised to carbon dioxide in two hours at 50° C. by hydrogen peroxide and ferric sulphate.[174]

With increasing amounts of hydrogen peroxide acting for a definite time Durrieux[48] found the reducing power rose to a maximum value and then fell to zero. When the catalysed oxidation was carried out with a constant amount of hydrogen peroxide, the acidity reached a constant value after a certain time. Samec[195-6] considers that a considerable number of carboxylic acid groups were produced in a sample of starch he oxidised by hydrogen peroxide.

In the oxidation of starch at 100° C.[106, 107] hydrogen peroxide was more effective than Activin or sodium perborate; at 137° C. Activin was the most effective. Patents[31, 35, 104, 114, 222] have been registered for the peroxide oxidation. Only the last two are English patents and the first[114] gives products which are suitable as printing thickeners in textile work, as they give smooth working pastes devoid of tackiness. The other is of interest to the food trade, as flour, as well as starch, is treated simultaneously with hydrogen peroxide and a source of active chlorine, the latter serving to deactivate the enzymes present which would destroy the peroxide and lower its efficiency.

Oxidation by Halogens

Moissan[156] found that carbon was deposited when fluorine reacted on starch, and no work appears to have been done on the modification of starch with fluorine diluted with air. With chlorine, however, the position is different, as many early investigators used chlorine to modify starch. According to De Gassicourt,[37] Fourcroy and Parmentier converted starch to sugar by chlorine treatment before Kirchhoff[137] discovered the acid-conversion method. Some time later, however, Liebig[145] reported that starch was very difficultly decomposed by the prolonged action of chlorine. Other workers have used more drastic treatments,[143, 215] but the products so obtained were of no commercial value.

Wolff[240] has obtained a slightly modified starch with acid properties. The effect of small amounts of chlorine on the course of amylase action on starch is interesting and has some commercial implications. For example, in the bleaching of wheat flour by chlorine, enzymatic activity was increased.[3] The amount of chlorine used was very small, 300 to 500 parts per million, but it nevertheless increased acidity and diastatic activity and was claimed to improve baking qualities. These changes were not encountered to any noticeable extent when nitrogen peroxide, nitrogen trichloride, or benzoyl peroxide was used for flour bleaching. Bromine was also tried and found to have the same effect. Gerber[81] finds that a very small amount of chlorine added to starch paste before the addition of an amylase accelerated hydrolysis by the enzyme, but a larger amount inhibits the action.

Samec[195, 196] oxidised moist starch with chlorine gas according to Kindscher's patent,[136] but at room temperature rather than at 100° C. Samec's chlorinated starch was oxidised to a greater extent than the starches oxidised by any of the other agents or methods which he used. The gel-phase of this chlorinated starch had the lowest molecular weight but the highest titratable acidity of all his oxidised products.

When chlorine water was allowed to act on amylose (β-amylose), Fletcher and Taylor[61] noted that the *p*H dropped rapidly from 7 to 1, while the reducing value underwent a sharp rise and the viscosity a simultaneous drop a few hours after the inception of oxidation. The reducing value and viscosity soon reached a constant value. This was not true of the reducing value when a phosphate buffer was used to keep the *p*H of the medium above 2. In the latter instance the sharp changes of viscosity and reducing value came in two minutes.

In connection with modification of starch by chlorine, Hirst, Plant and Wilkinson[117] used chlorine as a catalyst in acetylation, and it should be noted that starch acetate has enjoyed a fairly wide popularity for many years as a substitute for gelatin in a number of applications. When amylopectin (α-amylose) is acetylated by this procedure the acetate obtained varies with the method of preparation, being more soluble and less viscous the more chlorine is used; amylose (β-amylose), however, always yields the same acetylated product.[108] It is possible that the catalyst chlorine oxidises or modifies in some other way the amylopectin before it is acetylated.

Numerous patents have been registered for the modification of starch by chlorine.[8, 9, 10, 13, 75, 109, 123, 125, 136, 149, 158, 209, 214, 237]

In one patent,[8] granted in Britain, thin boiling starches or, if desired, highly soluble dextrines which are from 1-99% soluble in cold water and do not set to a gel on cooling are made by drying the starch and roasting in an atmosphere containing 0·03-0·06% chlorine on the weight of starch. With this amount of halogen and roasting for two hours at 115-135° C. a thin-boiling type of oxidised starch is produced. If a white dextrine (lighter in colour than acid roasted dextrines) which is 99% soluble in cold water is required the chlorine is increased to a concentration of between 0·06 and 0·12%

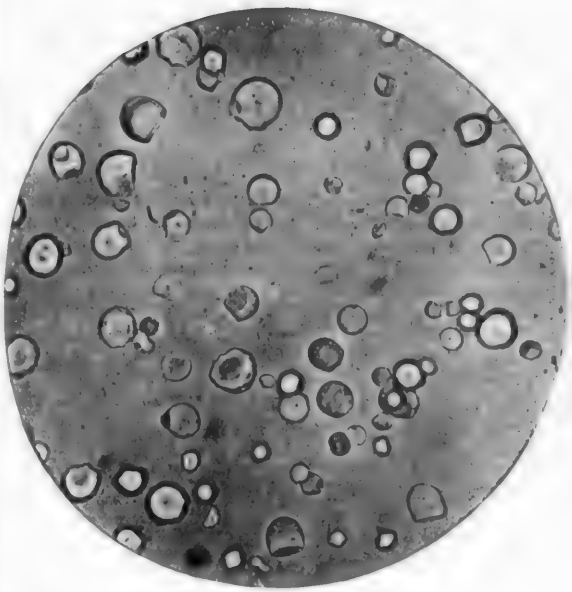


Fig. 5.—Cassava starch.

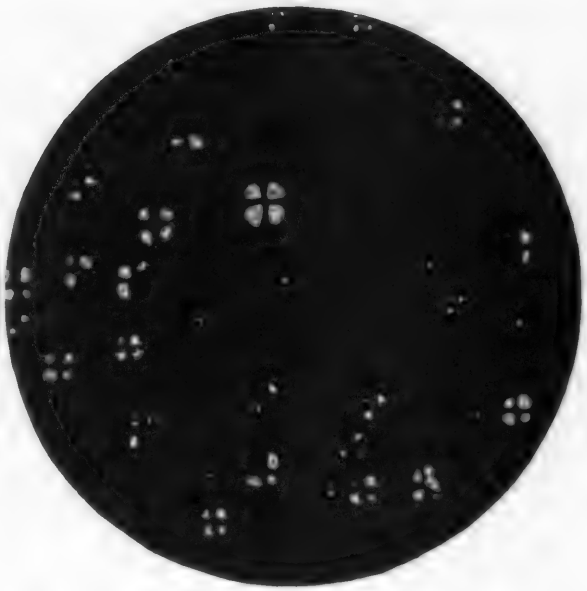


Fig. 6.—Photomicrograph of cassava starch taken in polarised light.

for the same roasting conditions. The more chlorine that is used the lower the temperature or the shorter the time of roasting required to obtain the same effect. There appears to be very few patents taken out in Britain for this type of process, although the products obtained would appear to be suitable for use in the food industry. The effect of bromine was studied by early workers, but no results of commercial interest were obtained. A fresh study of this halogen used under conditions similar to those in the above patent might be of value.

Franchimont,[67] in order to exclude oxidation, treated dried potato starch with dry bromine and with bromine in chloroform. He reported the starch to be absolutely unchanged if all moisture was excluded, but hydrobromic acid is formed in the presence of moisture and acts on the starch.

Lintner[146] and Syniewski[225] prepared a soluble starch using bromine. Bergmann and Ludewig[7] found the presence of acetyl groups in acetylated starch of 46-48% acetyl content had very little effect on the adsorption of iodine or bromine, and this agrees with the view that bridge oxygen atoms were responsible for halogen absorption of starch. Whilst starch and starch triacetate absorbed both iodine and potassium iodide from I-KI solution, only the bromine was absorbed from bromine-potassium bromide solution. Everett and Sheppard[61] followed the action of bromine water on solutions of polysaccharides by both chemical and physical methods. They found that the oxidations of starch and soluble starch resembled those of α-glucosides and there was some evidence of the formation of keturonic acid derivatives of the anhydroglucose polymers. Only one patent appears to cover the use of bromine for modifying starch.[188]

The formation of a deep blue complex between iodine and starch is well known, and when this complex is heated it is decolorised. Personne[179] considered some of the iodine was lost by volatilisation and that some of the iodine converted the coloured complex partly to a colourless starch-iodine compound and partly to sugar. The last two processes undoubtedly would involve hydrolysis and oxidation. Rodewald and Kattein,[184] however, solubilised starch by heating with iodine at 130° C. and recovered the starch by precipitation and iodine removal. By rapidly heating to 100° C. followed by rapid cooling Andrews and Goettsch were able to restore the original intensity of the starch-iodine colour, and they consider that the intensity of the returning colour depends on the length of the heating period, the achroic point being reached after heating 65 hours with 2·3 equivalents of iodine. The temperature of decolorisation does not correspond to the temperature at which the colour reappears, nor is it reproducible a second time with the same solution[3] and oxidation has, no doubt, taken place. Other workers have studied the oxidation of dextrines when heated with iodine, whilst the reaction between iodine and starch has been discussed[37] by the author at length elsewhere.[188] It would not appear that oxidation by iodine would ever be a serious commercial possibility owing to the greater weight required, its much greater price and its much lower activity when compared with chlorine.

"The Oxidation of Starch" will be continued in a forthcoming issue. Publication of the complete list of references will be given in the concluding instalment.

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Food Research in the U.S.S.R.

Some Studies in the Decomposition of Meat

On the nature of the process of meat decomposition. A. I. Artyukh. (*Problems of Nutrition*, 1941, *Vol.* 2.)

CHANGES in composition of the protein fraction and of the histological structure of muscular- and fat-tissue of meat, stored for five days at room temperature, were investigated by the author; the interdependence of chemical, histological and organoleptic changes of meat during the above conditions of storage were also studied.

A decrease during decomposition was observed in total water-soluble-N (3·10 mg. per cent. on the fifth day, against 3·49 mg. per cent. on the first day of storage); disintegration was also recorded in the albumin fraction (1·50 mg. per cent. against 1·93 mg. per cent.) and a decrease noted in globulin-N (2·86 mg. per cent. against 2·66 mg. per cent.).

Increases were recorded in the two following components: residual-N (1·85 mg. per cent. on the fifth day, against 1·25 mg. per cent. on the first day) and ammonia (13·23 per cent. more on the fifth day than on the first). The water content fluctuated between 74·40 and 75·75 per cent. *p*H values increased from 5·7 on the first day to 6·5 on the fifth, thus confirming the increase in ammonia.

From tables compiled by the authors it can be seen that neutral fats, fatty acids, glycerine esters, cholesterine esters, mixtures of cholesterine and neutral fats, and of cholesterine and cephalins are present in the meat during the whole of the investigation. Phosphatides and mixtures of cholesterine and fatty acids are found in smaller quantities on the second day than on the first.

Histological observations during the process of meat decomposition show that nuclei lose their capacity to stain, transverse and longitudinal muscle-fibre connections become disorganised, intermuscular connective tissue breaks up, muscle bundles loosen, protoplasma is fragmented, and is even partly vacuolated.

The colour of meat changes from the bright red and shiny appearance of fresh meat to a dull, dirty green-yellow. Mould accumulates and elasticity of the meat is completely lost.

Assay of the freshness of meat based on its CO_2 content. B. O. Lyubin, M. A. Lebedeva. (*Loc. cit.*)

According to the degree of meat decay, the quantity of CO_2 contained in the food increases. It is thus possible to estimate the sanitary value of the meat by measuring its CO_2 content. The authors elaborated a method for the determination of CO_2 in beef meat; operations consist mainly of the following points:

50 gm. of minced meat were placed in a 50 ml. Drechsel flask which was hermetically sealed to avoid any loss of CO_2. The flask was then placed for an hour in a thermostat at a temperature of 37° C. and cooled to room temperature before the contents were titrated. Determinations of CO_2 formed by the meat were subsequently carried out with the help of a Haldane apparatus and proved to give identical results for parallel experiments. Air was passed first through two Drechsel flasks containing baryta water; the current, freed from its CO_2, then entered into another Drechsel flask containing the minced meat; it was finally conducted into two more Drechsel flasks which contained a titratable solution of $Ba(OH)_2$. According to the titration of the latter substance, the amount of CO_2 liberated by the meat could be estimated (Pettenkofer's method: absorption of CO_2 in a known volume of baryta solution and titration of the excess with alkali).

According to the data obtained by the authors, fresh meat contained from 17 to 33 mg. CO_2 in 100 gm. of meat. The presence of 35 to 50 mg. of the gas in 100 gm. of the food points to the initial stages of decay. Analyses made at later stages of decomposition exhibited a sharp increase of CO_2 content. Immediately after boiling, the meat did not contain any CO_2 at all. 20 mg. of the gas in 100 gm. of boiled meat indicated decomposition.

The decomposition of meat proteins under the action of pure cultures of micro-organisms. G. V. Kolobolotsky. (*Loc. cit.*)

Meat on which the experiments were carried out had been obtained from animals which were cut up immediately after slaughtering; samples of 40 to 50 gms. each were taken and placed in a sterile Petri dish. Pure cultures of *B. coli communis* and *B. proteus vulgaris* were grown on agar media. Each sample of meat was infected with 0·25 ml. of the culture. After infection, the meat was kept at 22° C. for five days. Non-sterile meat samples and those infected with impure cultures were discarded. Changes in the following were recorded: total-N, amino-N, ammonia-N, formol-titratable-N and *p*H. From tables compiled by the authors it is clear that chemical changes proceed more rapidly in artificially infected meat than during the process of natural decay. It was shown, furthermore, that *B. coli communis* decomposes meat with formation of smaller quantities of amino-N than *B. proteus vulgaris*. On the third day after infection, for instance, 508 mg. per cent. amino-N were produced in meat decomposed by *B. coli communis*, against 890·66 mg. per cent. amino-N formed in meat infected with *B. proteus vulgaris*. It can also be said that meat infected with a pure culture of either *B. coli communis* or *B. proteus vulgaris* and stored for only two days becomes unfit for consumption.

Passage of air considerably increases the decomposing activity of the bacilli, especially in meat infected with *B. proteus vulgaris*: amino-N representing as much as 88·6 per cent. of the total-N is produced in a short time. One can finally conclude from the results obtained by the authors, that after the great increase displayed by the organism under anaerobic conditions, substances are formed which hinder further development by means of proteolytic activity.

Blackplate Cans for Processed Foods

Part II.

This article, which is a continuation of the one published last month, describes the results of investigations, directed towards the economy of tin, carried out since May, 1942

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IN a previous article* on the use of blackplate for processed food cans, a brief outline was given of the work that had been done in this country during the first four months since the Japanese overran the principal tin-producing areas of the world, with a view to economising tin in the manufacture of food cans. Three months have elapsed since the stage described in that article was reached, and during that time much experimental work, then in its very early stages, has almost reached finality; a great deal of first-hand information has been received from America, and some entirely new lines of work have been undertaken. The whole prospect, both of the possibilities of immediate saving of tin, and of the longer-term policy best calculated to stabilise the food industry over the period of years for which tin is likely to remain a comparatively rare and precious metal, has altered quite substantially as a result of the events of the last three months. It is felt, therefore, that although much hard work remains to be done, and changes at present unforeseen may yet take place, it is worth while at this stage to bring the statements made in the previous article up to date and to make fresh forecasts about both the immediate and the more distant future.

Initial Work

In the beginning, it very quickly became apparent that even cold-reduced blackplate would be unsuitable for making all food can ends if protected by only a single coat of lacquer applied in the flat sheet. At that time it was considered that the additional protection which might be afforded by applying two coats of lacquer in the flat sheet would not be sufficient to overcome the rusting, staining and lacquer peeling occurring on single-lacquered ends. Metal exposure caused during the manufacturing processes would still be very high, and accordingly efforts were directed towards the testing of ends dip-lacquered after fabrication and to designing machinery for dipping them at high speeds.

The experimental packs made with such dip-lacquered ends produced in the laboratory have now been under test for nearly five months, and have been found, apart from their rather greater tendency to external rusting, to be practically equal in performance to plain or lacquered tinplate for all the wide range of non-acid products tested.

The large amount of plant required to dip-lacquer all the country's requirements of open-top ends for non-acid processed foods has been designed, but a great deal of expensive machinery would be needed for so large an output, incorporating plant to recover the enormous amounts of lacquer solvents which would otherwise be wasted, for the solvents used in the phenolic resin lacquer required for satisfactory performance of dip-lacquered ends are in very restricted supply. All this plant would require a considerable amount of money and—what is more important—time to erect, and a decision to build it has become very difficult to make in view of recent developments both in this country and in America on alternative methods of protection.

Change of Outlook

The phosphate process, known as Bonderising, which provides an undercoat for lacquer, and which it was hoped at one time would, as was reported from America, render dip-lacquering unnecessary, has not yet shown sufficient promise to influence either immediate or future policy. Large-scale production plant in America has not emerged from its teething troubles as quickly as had been hoped, and experimental packs made with plate imported from America have not proved the extra adhesion afforded to the lacquer by the phosphate film to be sufficient to render dip-lacquering unnecessary. Two other developments, however, have called for immediate and intensive consideration.

Small-scale tests by one packer on a limited range of products have suggested that if two coats of lacquer are applied in the flat sheet, the undercoat being an ordinary oleoresinous film, and the top coat a phenolic meat lacquer, quite good results may be obtained for many foods, at any rate as far as the condition of the product and internal corrosion of the can are concerned. When these findings were communicated work was immediately put in hand on much larger-scale tests with a full range of non-acid products, and although the packings are somewhat belated it may be possible to reach a final decision on them before very long. If these ends, lacquered only in the flat sheet, prove satisfactory, it will, of course, be possible to change over to blackplate immediately, without the installation of any additional equipment beyond that required to coat both sides of a sheet of plate at once. This is a very simple matter, but would probably be essential if four coats of lacquer (two outside and two inside) are to be applied to large quantities of plate which have hitherto been either plain tinplate on both sides or at most single-lacquered on one side only.

Electro-tinning

The major change of thought, however, has come with the realisation not only that electro-tinned plate is the soundest long-term policy for the economy of tin

* FOOD MANUFACTURE, xvii, **8**, 229.

(this, of course, has been realised from the very beginning), but that it may be possible to start its production in this country within a period of time short enough for it to have a material bearing on any immediate action that is to be taken.

Electro-tinned plate is produced in America by two processes, one using an acid bath and the other using an alkaline bath, and it is thought there that two weights of coating, one carrying 1·6 ozs. of tin per basis box and the other carrying 8 ozs. per basis box (as against 20-24 ozs. carried by standard hot-dipped tinplate) will, if adequately lacquered in the flat sheet, take care of practically all the tin box and food can trades' needs except perhaps for the packing of highly acid fruits.

There are undoubtedly many problems to be solved before electro-tinned plate can be made and used in this country. Both types of bath have desirable and undesirable features, and the best plate for all purposes will have to be worked out. Flash-melting, or flow-brightening, as it is called in America, may prove to be essential for rapid soldering and for the production of plate with sufficiently low porosity. If so, there will almost certainly be problems in the way of flash-melting sheet which have not been encountered in America, where the development of electro-tinning has been done on strip. Electro-tinned plate with low tin coatings is not so readily solderable as is hot-dipped tinplate, particularly, according to American reports, when it is used for purposes for which it has had to be protected by the application of lacquers stoved at high temperatures, as it will undoubtedly have to be if it is to be used to make cans for processed foods.

However, none of these problems seems likely to require very long to solve once even small production quantities of plate are available to work on, and these will in all probability be obtainable in a very few weeks' time. One small pilot plant designed to produce between two and five boxes of full-size plate per hour is reported to be within a few weeks of making trial runs, and plans are being considered for the construction of a small production plant considerably larger than this.

Food Can Bodies

Up to the present moment no work at all has been done on the direct soldering of blackplate on high-speed machines. Work done earlier in the year on hand soldering, and other work done some five years ago on automatic side-seam soldering machines showed that by the use of highly corrosive fluxes very good soldered joints can be obtained on white-to-the-edge blackplate, but the dangers of subsequent corrosion by the flux residues were regarded as too great for the process to be embarked on commercially. Attempts to wipe off or neutralise flux residues eventually result merely in spreading instead of removing them.

In the previous article, methods were mentioned whereby it was hoped that it would be possible to apply a coating of tin to blackplate only on those narrow strips which are subsequently to be soldered in the side seams. These methods were :

1. Immersion of the edges of blanks in a corrosive flux followed by immersion in molten tin. It has not yet proved possible to develop this process to speeds anything like adequate for open-top can production.

2. The application of a tin-resisting lacquer, leaving unlacquered stencils, followed by passing the lacquered plate through tinning pots in the normal way. No tin-resisting lacquer from raw materials of reasonable availability has yet been forthcoming.

3. The Bonderite film has been found to resist tinning, but, as mentioned above, considerable doubt has arisen as to whether Bonderised plate suitable for the manufacture of food cans can be produced in this country soon enough to play any important part in the wholesale economy of tin that is so urgently called for.

From what has been written above about electro-tinned plate, it will be amply evident that this commodity is now looming large among the prospects of economising tin in open-top can bodies, but efforts are now being made to effect a saving before electro-tinned plate will be available, by once more attacking the problem of direct soldering of blackplate.

If the double roller-coating process, already referred to, proves adequate for the protection of ends, there is some possibility that it may be acceptable for bodies, thus enabling us to side-step the enormous problem of building, in a reasonably short time, automatic plant for high-sped dipping or flushing of blackplate bodies.

Overcoming Corrosion

Information recently received from America has suggested that even though corrosive fluxes must be used, it is possible to cut down the danger of subsequent corrosion to a negligible minimum, and large-scale tests are being put in hand to examine the applicability of this information to English machinery and conditions. The employment of a very narrow external solder stencil will obviously cut down to a minimum the area of plate eventually left uncovered by either lacquer or solder, but the major contribution from America seems to be the discovery that a slightly roughened surface on the plate will enable that portion of the plate to which flux is applied to be thoroughly wetted with a minimum of flux. Much of the subsequent corrosion experienced with ordinary bright-finished blackplate is due to the poor wetability of the surface, which makes it necessary to apply far more flux than can be either used up or driven off in the soldering operation. The effect of the roughened surface is closely analogous to that of the surface of ground glass, which is readily and completely wetted by a thin film of water, which on an equal area of plate-glass would de-wet into a number of small droplets.

The roughened surface is achieved by sand blasting the last pair of cold rolls, which, with strip plate, retain their roughened effect over a full day's production; though with sheets instead of strip it is possible that the life of a "blasting" might be considerably reduced.

Silver-Lead Solder

In the previous article no mention was made of attempts to economise tin in solder. The solder normally used to seal the side seams of open-top cans and the end seams of milk cans contains approximately 40 per cent. of tin and the remainder lead. Experimental runs on high-speed body-makers made in June of this year showed that with the use of acid fluxes instead of the normal rosin flux, can side seams could be soldered with a tin-lead alloy containing only 30 per cent. of tin.

It was found, however, that owing to the long plastic range of this solder, the lap joints tended to open slightly before the solder could be solidified; moreover, the saving of 25 per cent. of tin, which the use of this alloy would realise, was not considered sufficient for any long-term usage, and intensive work was immediately begun on the use of the eutectic alloy containing 2½ per cent. of silver, 97½ per cent. of lead and no tin at all.

This alloy has excellent sweating properties and forms joints at least as strong as those formed by a 40 per cent. tin 60 per cent. lead solder, even when the conventional rosin fluxes are used. It melts, however, at 304° C., which is over 65° C. higher than the liquidus temperature of 40-60 tin-lead solder, and this has introduced two difficulties which have prevented its immediate adoption.

During its passage over the solder roll of a body-maker, a can cylinder receives two ridges of solder, one on each side of the actual seam, and with normal tin-lead solders these remain plastic long enough to be removed completely by the wiping mop. The silver-lead alloy, however, solidifies immediately, and the two bands of solder must be melted again before they can be wiped. On the bulk of body-makers in this country there is not sufficient room between the solder roll and the wiping mop to allow for sufficient burners to melt this metal in the fraction of a second allowed by high-production speeds. Quite a major piece of reconstruction of the machines is needed to allow for the incorporation of a sufficient number of burners, and although the nature of the alteration is simple, a considerable number of machines are affected, and time will be required for the change-over.

The second difficulty arises from the fact that the higher working temperature of the silver-lead alloy causes serious scorching of the ordinary oleoresinous lacquers normally used for coating the interior of fruit and vegetable cans. Fortunately, the phenolic meat lacquers are not affected in this way, and it is hoped that it will soon be possible to take a decision, as an emergency measure at any rate, to use this type of lacquer for all processed food cans requiring internal protection by lacquer.

Certain technical aspects of the use of this new solder still require long-term work to clear them up; such as, for example, the ageing of the joints formed and the effect of the gradual picking up of tin by the solder bath from the tin-coating on the plate being soldered. However, it is felt that on the strength of practical experience in America, now of some months' standing, the lack of complete information on these points need not interfere with a rapid change-over to an alloy which achieves 100 per cent. saving of tin.

It should be remembered that it is not considered likely that we shall be able to solder blackplate with any alloy containing much less than 40 per cent. of tin.

Lard as All-Purpose Cooking Fat

In exhaustive tests conducted by the research laboratory of the American Meat Institute on the relative shortening values of lard, hydrogenated cottonseed oil, and compound, the following results were obtained:

	Comparative Shortening Value.
Refined lard	100 per cent.
Animal stearine vegetable oil compound	74 ,, ,,
Hydrogenated cottonseed oil A	73 ,, ,,
Hydrogenated cottonseed oil B	70 ,, ,,

The shortening value or the shortening power of a fat may be defined as that quality of the fat which prevents batters or doughs from forming a hard, brittle mass when cooked. Sometimes the same idea is expressed by stating that "fat cuts the flour gluten" when speaking of pastry or biscuits, and that "it cuts the molasses or sugar" in crisp, hard cookies or wafers. In other words, if flour and water are mixed together and baked, the resulting product is hard and resistant. This is because the gluten of the flour, which is a sticky substance when wet, forms a continuous network throughout the dough in the absence of fat.

How Lard Works

When the moisture is driven off in baking, this continuous network of gluten binds the starch of the flour together tightly. If, however, a fat is worked into the flour and water, the gluten threads are broken and separated and the resulting baked product is tender and chewable, or, as it is stated, "short". The finest baked products are those in which this tendency of the gluten to fuse and this tendency of the shortening agents to insulate and prevent its fusion are nicely balanced.

In determining the shortening value of the various fats experimentally, an instrument called a shortometer was used. The shortometer is a device by which the pressure required to break a test wafer can be measured much like the method used on a large scale in determining the breaking strength of building materials.

In practice, it has been found that if the amount of lard in a pie-crust formula is reduced 25 per cent. the resulting crust will have the same shortness as one made from hydrogenated cottonseed oil using the full amount of fat in the formula. In other words, in pie-crust 75 lbs. of lard has the same shortening power as 100 lbs. of hydrogenated cottonseed oil.

The general qualities of lard that make it a valuable fat in cookery are: (*a*) its high digestibility; (*b*) its great shortening power, greater than that of any other plastic, edible fat; (*c*) its wide plastic range; (*d*) its marked economy

Correction

The Manufacture of National Bread

In the above-named article (FOOD MANUFACTURE, August issue) the following corrections are necessary:

Page 214, Under sub-heading "Salt Content", line 2 should read, "Half a pound per sack *extra* is required".

Page 214. Under sub-heading "Malt", line 8, salt should read as *malt*.

Page 215. Under recommendation (5) should read, "Give the doughs a *normal* amount of mixing".

Page 215. Under sub-heading "Storage of Wheatmeal", line 1 should read, "The responsibilities of the baker do not *only* start with the making of the dough".

Ministry of Food

Latest Statutory Rules and Orders

The list given below is the continuation of the list of Orders published in *Food Manufacture*, August 1, page 232.

No.	*Date.* 1942.	PRICE FIXATION ORDERS
767	Apr. 24.	Amending the Invert Sugar (Maximum Wholesale Prices) (No. 2) Order, 1940.
768	,, 24.	General Licence under the Home Grown Rye (Control and Maximum Prices) Order, 1941. (1941 No. 1398.) Revokes S.R. & O. 1942 No. 177.
796	,, 30.	The Egg Products (Control and Maxi- Prices) Order, 1942.
814	,, 30.	Amending the Oats (Control and Maximum Prices) (Northern Ireland) Order, 1941.
830	May 2.	Amending the Threshed Home-Grown Peas (Control and Maximum Prices) Order, 1941.
861	,, 6.	New Potatoes (1942 Crop) (Control and Prices) Order. Revokes S.R. & O. 1942 No. 537.
863	,, 6.	Soya Flour (Control and Maximum Prices) Order. Revokes S.R. & O. 1941 No. 1994, and 1942 Nos. 108 and 348.
		CEREALS
824	May 1.	Amending the Rice (Control) Order, 1942.
864	,, 6.	Transport of Flour Direction.
872	,, 7.	Amending the Food Transport Order, 1941, and giving Directions thereunder. (Flour.)
876	,, 7.	Amending the Flour (Restriction on Use) Order, 1942.
		EGG PRODUCTS
1034	May 29.	Egg Products (Prohibition of Retail Sales) Order.
		FEEDING STUFFS
822	May 1.	Directions under the Feeding Stuffs (Rationing) Order, 1942.
875	,, 7.	Directions under the Compound and Mixed Feeding Stuffs (Control) (No. 2) Order, 1940. (National Cattle Food.)
		FISH
957	May 21.	Immature Sea-Fish Order.
		FRUIT
877	May 7.	Gooseberries (Control of Picking) Order.
1043	,, 30.	Fresh Fruit and Vegetables (Restriction on Dealings) Order.

No.	*Date.* 1942.	GENERAL
831	May 2.	Amending the Retail Prices (Notices) Order, 1942.
843	,, 5.	Amending the Seizure of Food Order, 1942.
856	Apr. 29.	Licensing of Private Collectors (No. 4) Order.
872	May 7.	Amending the Food Transport Order, 1941, and giving Directions thereunder. (Flour.)
885	,, 9.	Amending the Food Control Committees (Local Distribution) Order, 1939, and the Food Control Committees (Licensing of Establishments) Order, 1941.
899	,, 11.	Directions made under the Food Transport Order, 1941. (Bread.)
901/S28	May 11.	Retail Deliveries (St. Andrew's) Order.
909	May 12.	Meals in Establishments Order.
		MEAT
910	May 12.	Amending the Bacon (Addition of Box) Order, 1940.
		MILK AND MILK PRODUCTS
900/S27	May 11.	Milk Marketing (Special Areas) (Scotland) Order.
923/S28	,, 14.	Milk Marketing (Special Areas) (Scotland) (Charges) Order. Emergency Powers (Defence) Act, 1939, S. 2(1).
		POINTS RATIONING
829	May 2.	Amending the Food (Points Rationing) Order, 1942.
1022	,, 28.	Amending the Food (Points Rationing) Order, 1942.
		RATIONING
841	May 4.	Amending the Directions, January 6, 1940, under the Rationing Order, 1939, as amended. (Butter, etc.)
884	,, 9.	Amending the Preserves (Rationing) Order, 1941.
		SUGAR
862	May 6.	Sugar (Control) Order.
		VEGETABLES
1035	May 29.	Amending the Potatoes (1941 Crop) (Control) (No. 2) Order, 1941.
1042	,, 30.	Revoking the Home-Grown Carrots (1941 Crop) (Control) Order, 1941.

Biotin

Biotin is of interest to microbiologists, botanists and biochemists. Also to the brewing industry because of its importance as an essential food factor for micro-organisms and plants.

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THE DISCOVERY that certain yeasts would not grow in a solution containing only fermentable sugars and inorganic salts led Wildiers in 1901 to suggest that yeasts require a growth factor, to which he gave the name "bios", meaning "life". Wild yeasts, however, appear to grow satisfactorily in the absence of bios, and it is only the more highly organised cultivated varieties that require the presence of the growth stimulant. At first it was believed that bios was a single substance, and its complex nature was not realised until 1922, when Fulmer and Nelson showed that it contained at least two components. Two years later Professor Lash Miller, in Toronto, separated it into two fractions, which he called "Bios I" and "Bios II", each of which was shown to be necessary for the growth of the particular type of yeast used by him. Subsequently some seven or eight components of the bios "complex" came to be recognised, each of which would serve as a growth factor, though not all were required by every strain of yeast.

Components of Bios

The factor which Miller designated "Bios I" was the first substance to be obtained in the pure state, and was shown by Miss Eastcott in 1928 to be identical with *meso*-inositol, a substance of topical interest, because phytic acid is inositol-phosphoric acid, now believed to be responsible for immobilising a portion of the dietary calcium, with which it forms a sparingly soluble salt. It also forms insoluble salts with other metals, notably iron, and excess phytic acid in the diet is a possible cause of secondary anæmia.

Two years later Professor R. J. Williams, working in Oregon, showed that aneurine (vitamin B_1) can act as a growth factor for certain strains of yeast, though not for others, and subsequently Miller proved that it was identical with his "Bios V".

In 1932 Kögl and his colleagues, in Utrecht, prepared a concentrate of another member of the bios group by an elaborate process of fractionation, and in 1936 Kögl and Tönnis succeeded in isolating this factor in the form of its crystalline methyl ester from egg-yolk. They assigned the name "biotin" to this new substance, which was afterwards shown to be Miller's Bios IIB.

Pantothenic Acid

Other substances have been prepared from time to time and identified with one or other of Miller's bios components. Bios IIA, for example, is identical with pantothenic acid, a substance which is now known to be essential not only for yeasts but for other micro-organisms, including the hæmolytic streptococcus and certain strains of the diphtheria bacillus. It is also essential for the growth of rats and chickens, and plays some *rôle*, not yet clearly defined, in human nutrition. Some yeasts, however (and some other micro-organisms also), are exceptional in being able to make use of a part only of the pantothenic acid molecule, and these will grow if provided with β-alanine instead of pantothenic acid. Pyridoxine (vitamin B_6) and nicotinic acid are other constituents of the bios group.

An important and significant point that is evident from this brief survey is the close parallel that exists between the members of the bios group and the members of the so-called vitamin B complex. It is tempting to speculate on the function of those factors about which little is known at present, bearing in mind that some of the older members are now known to constitute essential groupings of certain co-enzyme systems. Thus aneurine pyrophosphate is co-carboxylase, whilst nicotinic acid is a constituent of co-enzyme I and co-enzyme II, and riboflavin—a member of the vitamin B_2 complex—is a constituent of Warburg's yellow enzyme.

These enzymes and co-enzymes play an essential part in the oxidation of carbohydrates and other substrates in the body to provide the energy for its various activities, and it is not impossible that all the members of the bios group and vitamin B complex may ultimately be shown to play a similar part in the metabolism of the organism. This would be in keeping with the fact that they are all components of the two materials which above all others are associated with active metabolic processes—the yeast cell and liver tissue—and it would also explain the almost universal requirement for these substances by a surprising variety of living creatures from the lowest forms of plant life at one end of the scale to man himself at the other.

Biotin

The extreme sensitivity of yeast towards biotin enables the substance to be detected and estimated in minute amounts, a dilution of 1 in 4×10^{11} being detectable by means of its effect on yeast growth. With the aid of this test, biotin was shown to be of universal occurrence in small amounts, but no source was discovered from which it could readily be isolated in quantity. Kögl, for instance, calculated that to obtain 1 g. of biotin from yeast would have required the working up of 360 tons, while the eggs necessary to yield 1 g. would have cost £35,000, although eggs contain ten times as much biotin as does yeast.

Biotin is not required by all yeasts, and some workers have indeed gone so far as to assert that all yeasts will grow in absence of biotin, which merely serves to make them grow more vigorously. Nor does biotin alone

produce maximal growth of yeast, for which there are also required inositol, pantothenic acid and other components of the bios complex. Biotin has been shown to be a growth factor for *Staphylococcus aureus* and for certain fungi, including *Nematospora gossypii*, a parasite that infests the cotton plant. Other fungi—for instance *Phycomyces blakesleeanus*—do not require biotin or inositol, but require aneurine, and Kögl suggested that such diverse biological needs as these provide an explanation of the widespread phenomenon of symbiosis. If Kögl's explanation is correct, each of the symbiotic partners synthesises a factor which the other requires and cannot synthesise for itself, enabling both to live under conditions in which neither alone would survive.

Biotin also plays a *rôle*, not very well defined at present, in the higher plants. Thus Kögl and Haagen-Smit showed that the growth of pea embryos is stimulated by biotin and aneurine, although biotin is normally present in small amounts in the cotyledons. Kögl regards biotin as a true plant hormone, circulating inside the cells of the plant. It is also probable that biotin is identical with the so-called co-enzyme R, which stimulates the growth of micro-organisms in the root nodules of leguminous plants.

Vitamin H

In 1927 M. A. Boas-Fixsen discovered that an unusual type of injury was produced by feeding large quantities of raw egg-white to rats; it was characterised by an eczema-like dermatitis and loss of hair, and could be cured by a factor present in potatoes, milk, yeast, etc., which she termed " protective factor X ". This substance has been extensively studied by György, first at Heidelberg, then at Cambridge, and recently at the Western Reserve University, Cleveland. He was able to isolate this substance, which he called " vitamin H ", from liver, and showed that it was similar in its properties to the biotin isolated by Kögl from egg-yolk. There is now little doubt that the two are identical. Only 70 mg. of the crystalline methyl ester of vitamin H were obtained from 5 litres of liver concentrate.

Egg-white loses its property of causing dermatitis and alopecia in rats when it is heated, and Eakin, Snell and Williams purified the heat-labile factor, which they termed " avidin ", and showed that it combines with biotin, thereby rendering it unavailable to the organism. Early this year György and Rose reported that the amount of avidin in uncooked egg-white is more than enough to neutralise the amount of biotin in egg-yolk; though after cooking the avidin is, of course, destroyed. Avidin has now been obtained in crystalline form by Pennington, Snell and Eakin, and independently by Woolley and Longsworth. It appears to be a protein containing a large carbohydrate moiety.

Biotin and Cancer

Biotin also cures chicks fed a diet containing a large amount of egg-white. On such a diet chicks, like rats, develop both a dermatitis and perosis, each of which is cured by biotin.

An interesting observation recently reported by du Vigneaud and his co-workers, and of which the significance is not yet clear, is that pure biotin markedly increased the incidence of cancer in a group of susceptible mice in which it was artificially induced by administration of the carcinogenic dye, butter yellow. The authors comment that it would be of great interest to test the effect of avidin in this type of cancer, as it might have the opposite effect to biotin and reduce the incidence of cancer in the mice. A recent hint in the American literature implies that biotin may be connected with other forms of cancer not induced by butter yellow. Further developments will be awaited with considerable interest.

A recent publication from the U.S.A. by Sydenstricker and his colleagues describes the effect of biotin deficiency in human beings. Four volunteers were fed for several weeks on a diet containing minimal amounts of biotin and with 30 per cent. of the calorie intake in the form of egg-white—an experiment with obvious technical difficulties in this country at the present time. All the subjects developed a scaliness of the skin in three to four weeks, which disappeared spontaneously in a few days. Later, the skin was again affected, and the dermatitis was accompanied by other symptoms reminiscent of vitamin B_1 deficiency, such as lassitude, muscle pains and hyperesthesia. The blood picture was also markedly affected. All these symptoms were cured in three to five days by the administration of a biotin concentrate.

Chemical Nature of Biotin

Biotin is a dextrorotatory acid of m.p. 230°-232° C.; on treatment with diazomethane it is converted into a methyl ester, m.p. 166°-167° C. It has the formula $C_{11}H_{18}O_3N_2S$, but its structure is not yet known, though a great deal of information has been accumulated in the last twelve months by du Vigneaud and his colleagues in the U.S.A. The present view is that biotin includes two condensed rings, one containing an atom of sulphur and the other containing two nitrogen atoms. Synthesis of the vitamin has not yet been claimed, nor has anyone yet put forward a structural formula.

Significance of Biotin

It is a little difficult at the present time to assess the importance of biotin. It is of interest to microbiologists and botanists, and to the brewing industry, because of its importance as an essential food factor for micro-organisms and plants. It is also of interest to the biochemist because of the part it plays in animal nutrition, but it is difficult to imagine that it will ever be of such profound importance in human nutrition as to require large-scale synthesis (should that ever become a practical possibility) for sale as a dietary supplement. It seems to be required in such small amounts and to be present in so many different types of foods—it occurs, for instance, in milk, eggs, liver, kidney, potatoes, peas and yeast—that we shall be in a sorry plight indeed if we are effectively barred from all the foodstuffs containing it. On the other hand, it is not impossible that biotin may ultimately be shown to have a specific effect on some particular function of the organism, and will find an application in the medicinal, rather than in the nutritional, field. It is now available commercially in the U.S.A., though not in this country, and probably this will stimulate investigations into its possible applications. There is now no doubt that biotin is of great importance to plant and animal life, but a considerable volume of work remains to be done before its precise *rôle* is clearly understood.

Vegetable and Fruit Research

THAT the pattern of scientific research is guided by the inspiration of wartime needs is attested to by the recently published report* for 1941 of the Long Ashton Experimental Station.

Alpha-Naphthalene Acetic Acid Sprays

Among the many items of work done figures that on the influence of alpha-naphthalene acetic acid sprays on the pre-harvest drop of apples under different systems of pruning. Trees of the variety of King Edward VII, growing under five different pruning systems, were sprayed with alpha-naphthalene acetic acid at two concentrations. Spraying with a 0·001 per cent. solution reduced drop appreciably when the trees were subject to a 50 m.p.h. gale. Drop from pruned trees was less than from unpruned trees and summer pruning reduced the drop compared with trees only winter pruned.

Manurial Experiments on Vegetable Crops

The effects of farmyard manure and various fertiliser treatments on a number of vegetables are reported. The main data sought were concerned with yields, but some interesting analyses were made of the carotene content of carrots subjected to different manurial treatments. The difference in the carotene values were found to be not very great, but those given by carrots receiving high nitrogen additions were found to be uniformly greater than those receiving little nitrogen. The values may be adversely affected by the presence of chloride.

Preservation of Plums

A matter of topical interest is the description by Charley, Hopkins, Keiser and Sills, of experiments on the large-scale preservation of plums by the sulphur dioxide cold process. The jam industry has always taken the view that the cold process is greatly inferior to the hot pulp method. The two principal objections raised against the cold process seem to be (1) that there is a much greater loss of pectin during the storage of the preserved fruit and (2) that the cold process requires greater storage capacity per ton of fruit.

The authors point out that in normal times it would be immaterial which method was preferred, but in wartime the wastage of any proportion of a large fruit crop is undesirable, and in the event of a glut crop of plums they feel that the cold process could preserve a much greater proportion of the crop *in the available time* than the hot process. The time factor is stressed.

The main points investigated were :

1. Pectin retention in hot and cold processes.
2. Effect of varying strengths of SO_2 on the efficiency of the cold process.
3. Effect of variety and maturity of plums on cold process results.
4. Distribution and changes of strength of SO_2 in fruit during preservation.
5. Effectiveness of various lining materials that could be used in storage vessels for large-scale cold process preservation.

It was found that there is a greater loss of pectin value in the cold process than in the hot, but jam-making tests have shown that this loss is not so great as to prevent the manufacture of satisfactory jams in the case of plums with their large initial pectin content. With other fruit less rich in pectin there might be a disadvantage.

Results are given showing the effects of varying SO_2 strengths in the preservation of purple Pershore plums by the cold process and also those obtained on maturity effects, variety effects and the distribution of SO_2 during preservation.

The use of different linings for storage vessels is also discussed. The authors are of the opinion that from the wartime angle the cold process merits the fullest reconsideration by the jam industry.

Malic Acid from Apple Treacle

A comprehensive study of the problems involved in the production of apple treacle was published in the Annual Report of the Station for 1940. In the Report under review, the possibilities of obtaining malic acid as a by-product is discussed by Charley, Hopkins and Pollard.

The malic acid is separated from the apple juice as the calcium salt, by the addition of calcium carbonate. Malic acid is liberated from the crude calcium malate by sulphuric acid, the calcium sulphate being separated by repeated centrifugalisation. The solution is treated with charcoal and evaporated *in vacuo* to a thick syrup from which malic acid crystallises out. An application for a patent has been made in respect of the process.

Utilisation of Surplus Carrots

Three outlets for surplus carrots are described by the same authors : (1) Production of treacle ; (2) pomace as a feeding stuff and source of pectin and carotene ; and (3) fermentation products.

The production of carrot treacle is described. It consists of the expression of the juice, its clarification and concentration. It has been found that enzyme methods of clarification were not successful, and further work on this was abandoned when it was realised that satisfactory results were to be obtained by a simple heat treatment. Raising the temperature of the juice to 160° F. brings about a sharp and heavy precipitation of nearly all the suspended matter present, both free and colloidal.

Concentration of the juices by vacuum and open-pan methods have been successfully accomplished. Neither the vacuum nor the open-pan product retains any noticeable carrot flavour. The vacuum product is extremely sweet and the open-pan product has a more characteristic caramelised and toffee-like flavour.

Samples of carrot treacles and concentrates have been examined by many food manufacturers, particularly in the confectionery, bakery and pickling trades. As an

* *The Annual Report of the Agricultural and Horticultural Research Station (the National Fruit and Cider Institute), Long Ashton, Bristol.* 1941.

additional source of sugar these products have met with almost unanimous approval, and very large quantities could be used provided the concentrates could be marketed at an economic figure. The price of carrot treacle, however, depends largely upon the price paid for *surplus* carrots—a matter, mention the authors, outside their sphere.

By-Products

The elaboration of by-products would lessen the cost of the main article—carrot treacle. The press-cake, when disintegrated and dried, provides a foodstuff of undoubted value. It is comparable in texture with dried apple pomace, and pomace driers can produce it from carrot press-cake without any appreciable departure from the usual conditions for apple product. It has three possible uses :

1. As a cattle feedingstuff.
2. As a source of pectin.
3. As a source of carotene.

As regards cattle feedingstuff, the pomace has, according to analysis, a value equal to that of dried sugar-beet residues. Given certain essential alterations in pectin extracting methods, it would appear that in the event of an acute shortage of the apple material carrot pomace could be usefully employed as a substitute.

Practically all the carotene present in the carrot is to be found in the pressed pomace; therefore this product could serve as a readily accessible source of carotene and therefore indirectly of vitamin A.

The authors point out that while dried grass offers a readily available raw material, the presence of chlorophyll and large amounts of lipoid material makes necessary processes of separation and purification which are not required when carrot pomace is used, chlorophyll being absent and lipoids present only in traces.

Large- and small-scale experiments on fermentation are reported. Carrot juice has been allowed to ferment under different conditions, but the ultimate products have not been satisfactory from the point of view of flavour.

Sources of Vitamin C

A review of existing literature has been prepared by V. E. Sells. The relationship between vitamin C content and the ripeness of rose hips is discussed and some work of different investigators quoted. The composition of rose hips, of hip jam and *purée*, and of hip soup and tea are given.

Another paper, by Hopkins, discusses concentrated swede juice as a source of vitamin C.

"Campden Fruit Preserving Tablets"

A progress report on the preservation of fruit with sodium or potassium metabisulphite demonstrates that the method has proved satisfactory with most fruits, save the less acid ones such as sweet cherries and pears. Methods of covering the jars and those for preparing the preserved fruits for the table are given.

The foregoing, while not exhausting the whole range of papers in the report, demonstrates the enthusiasm and energy of all concerned in tackling current problems. The trend of the work has been, not to produce laboratory results, but to keep a keen eye on the possibilities of the processes in large-scale practice.

T. C.-W.

The Literature of Food Investigation

The latest volume[1] of abstracts from the literature of food investigation indicates no paucity of work done in the period covered. It is curious, perhaps, that the subject of fruit and vegetable dehydration does not appear to have been written about extensively—under the appropriate section there are only four references to articles and two patent specifications. The only article on the drying of vegetables mentioned was one by V. A. Beckley and V. E. Notley, *E. Afr. Agri. J.*, 1941, **7**, 3.

Under "Meat" there are no startling developments recorded through the literature; Hankins and Hiner, *Refrig. Engng.*, 1941, **41**, 185, discuss changes in appearance, especially colour of meat during freezing and storage. Out of five abstracts on canning and glass packing, three are from American articles. The literature of meat by-products, spoilage and putrefaction, contains some articles of considerable interest.

The literature of fish, dairy products, fruit and vegetables is rich in its different aspects, while the sections on the theory of canning, theory of freezing and chilling, and engineering show sustained investigation.

Under abstract No. 1,452, an article entitled "Paper Can that can Take it" *Food Industr.*, 1941, **13**, (No. 2) 54, is noted. It describes a new type of food container, the "Bandcan", which is reported to withstand a temperature of 360° F. and internal pressure of 105 lbs. per sq. in. The side walls are made by rolling adhesive-coated paper into a five-ply cylinder, inserting a metal band wound convolutely into the ends of the laminated walls, and seaming the metal ends to this metal band. The container can be made moisture vapour-proof for storage of hygroscopic materials and oil- or grease-proof, and is suitable for food products which do not require retorting.

As usual, the abstracts are excellently done, and this latest addition to the Index will be welcomed by those interested in food research.

T. C.-W.

Emergency Legislation

Those whose task it is to be familiar with the constant changes in and additions to wartime food regulations and have little time to classify and index the almost daily influx of new Orders, much less refer them back to the original clauses of the Food and Drugs Act, 1938, will welcome a recently issued volume[2] which reduces work of this nature to a minimum.

The classified tables of references with which the book leads off are themselves worth its cost, giving as they do an index to the definitions and standards of substance and quality of the different foods, together with the corresponding page in *Bell's Sale of Food and Drugs*, 10th edition.

Part II consists of a review of emergency legislation and gives the whole story right from the beginning up to January 31, 1942.

[1] *Index to the Literature of Food Investigation. Vol. 13, No. 3, December, 1941. Compiled by Agnes E. Glennie, B.Sc., and Catherine Alexander, B.Sc., 1942. 4s. 6d. net.*

[2] *Second Cumulative Supplement to Bell's Sale of Food and Drugs. 10th edition. Pp. 88. 1942. 7s. 6d. net.*

Addenda to the main book comprises Part III, which deals principally with the Pharmacy and Medicines Act, 1941, but only such sections as have a bearing on the powers of the Food and Drugs Authorities.

The rest of the book is taken up with quotations from Regulations and Orders, from such quotations being omitted preambles and other formal portions, as well as provisions not relevant to the subject-matter of *Bell's Sale of Food and Drugs*. Orders fixing maximum prices for articles of food are not quoted unless they contain definitions or other provisions affecting the administration of the Acts and Regulations with which the book deals. For quick reference this arrangement is ideal, and the volume should be in the hands of anyone whom food regulations affect.

T. C.-W.

Restoration of Pre-War Trade Practices

THE term "trade practice" in connection with the Restoration of Pre-War Trade Practices Act, 1942, is defined as meaning any rule, practice or custom (whether by contracts of employment or otherwise) observed in any concern as regards persons to be or not to be employed—*e.g.*, men or women, boys or men and so forth—and in regard to the conditions of employment, hours of work or working conditions of the employees —*e.g.*, hours of working week, overtime matters, five- or six-day week, proportion of young persons to adults, ages and experience for certain processes, whether operations are skilled or semi-skilled, apprenticeship matters and so forth.

The chief provision puts upon employers the obligation to restore any trade practice in operation before September 3, 1939, which has been departed from since that date, within two months after the end of the war period, and to maintain the practice for at least eighteen months from the date of the restoration or the date considered as the end of the war (the Ministry of Labour will appoint such a date), whichever is the later.

The above notwithstanding, where, as may well happen, it is thought desirable to retain any wartime practice, the obligation as above can be departed from (waived entirely or modified) if the particular employer or employer's association and the relevant trade union come to an agreement to this effect (if the parties cannot exactly agree, arbitration can be used), but the trade union must be one which was concerned with such trade practices pre-war.

Questions in dispute as to whether an employer has failed to meet the obligation (or whether the obligation applies) on being reported by the relevant trade union or employers' association, must be referred by the Ministry of Labour to any existing conciliation machinery domestic to the industry, or if there is no such machinery the Ministry can take such steps as is considered advisable or refer the matter to an arbitration tribunal as laid down in the Act, and arbitration must be used where the other methods mentioned have been tried without result.

An award—with the employer considered at fault—must show where the obligation has not been met, the practice particularised, and precisely what steps are to be taken to meet the obligation be stated; the period for which the practice is to continue must be stated. This need not be exactly as laid down in the chief provision as above, meaning that it can take effect from the date of the award or earlier (not earlier than the date when reported to the Ministry), but not so as to expire later than eighteen months from the date of the award. If by the non-observance of the trade practice any employee has been underpaid, the award may provide for a sum to be paid to rectify the under payment.

An employer is not liable to a penalty until an arbitration award has been issued, but then, if he defaults, he is liable, on summary conviction, to be fined anything up to £5, and, if he still defaults, a fine of £50 (or less) for each day on which the default continues after the first conviction.

The Act applies to new firms commencing during the war period. As to old establishments, the practices to apply are those which were in operation pre-war in concerns of similar nature.

If the firm is on "munitions of war" the obligation applies to trade practices in operation on April 30, 1939, and departed from after that date, instead of the date September 3, 1939, applying as ordinarily; it should be noted that the term "munitions of war" means articles, materials and devices, as well as actual armaments, ammunition, ships, aircraft and so forth.

Dehydration in South Africa

MEAT, milk, fruit, vegetables are now being processed in several of the new dehydration plants in the Union, but so great is the present local demand for all kinds of farming produce that none of these products can as yet be exported. The erection of a huge dehydration plant, capable of dealing with vast quantities of fruit and vegetables and so eliminate gluts, has been suggested to the South African Government. It has been urged that if such a plant were erected there would be no need for fruit and vegetables to be wasted or to be placed on the market at prices unprofitable to producers. The Government has given sympathetic hearing to these recommendations. At the same time it has not overlooked the big objection to this scheme, and this is that such a large plant could not be allowed to remain idle at intervals. Gluts occur irregularly, and in times such as the present most of the crops produced in South Africa are readily absorbed, which means that the quantities available for processing are likely to be uncertain until after the war is over. It is argued, however, that this position could be met by encouraging production on a large scale. Raw material for the dehydration plant would then be abundant and what was not needed by the Union could be exported. Reserves of concentrated "dried" foods could also be built up in times of abundance and used when necessary—for instance, in time of drought or to feed the native population. It is also pointed out that vast quantities of food will be required for the starving or mal-nourished millions in Europe after the war. Sent in concentrated form, the food would occupy less cargo space and could be handled easily. For many years to come, it is considered, great strides will have to be made in improving and increasing the diet of people all over the world.

Correspondence

The National Bread

TO THE EDITOR OF FOOD MANUFACTURE

DEAR SIR,—To cross swords—or should it be pens?—with my friend Mr. Fairbrother is a pleasure restricted now by the national shortage of paper. On this occasion, however, the issue that I want to raise is a simple one, and can, I hope, be quickly disposed of. Incidentally, it is precisely the point that I raised in a letter published a little while back in this journal (FOOD MANUFACTURE, 1941, **16**, 185); in Mr. Fairbrother's reply on the same page he unfortunately omitted to answer it.

Mr. Fairbrother's claim that the miller is a philanthropist may, indeed, be true, but his figures do not prove it, unless he makes a certain assumption. What I want to know from him is whether that assumption is justified. "Suppose a miller starts with 100 lbs. of wheat", to use Mr. Fairbrother's own words, he may either mill 70 lbs. of white flour, for which he gets 8s. 4d., and 30 lbs. of offals, for which he gets 2s. 1d., total 10s. 5d.; or he may grind the lot to give him 100 lbs. of wholemeal flour, for which he gets 11s. 10d. Net loss, 1s. 5d.! But surely this is only true if there is a demand for the extra 30 lbs. of flour so produced. If there isn't, presumably he is left with 30 lbs. of wholemeal flour on his hands, which he can neither sell to the baker or manufacturer for use in bread and other human food, nor to the farmer, because cattle can't be fed on wholemeal flour. As many protagonists of white flour argue that the public will eat less wholemeal than white bread, far from being able to sell the extra 30 lbs. of wholemeal flour, it would seem that he may not actually even sell 70 lbs. If Mr. Fairbrother can show reason for us to believe that the miller can really *sell* 120 lbs. of wholemeal flour for more money than he would get if he sold 70 lbs. of white flour and 30 lbs. of offals, then he may stand a chance of convincing me that the miller's motives are, at any rate in part, philanthropic.

I am, etc.,
A. L. BACHARACH.

GLAXO LABORATORIES, LTD.

The Sector Scheme

TO THE EDITOR OF FOOD MANUFACTURE

DEAR SIR,—The July issue of FOOD MANUFACTURE has interested me once again as much as ever, but I have been especially attracted by the article "Zoning the Food Supply" on pages 191-2.

In the present national emergency surely no one can doubt but that any good "Sector Scheme" which proves workable will be a very good thing indeed; but, to use the words of the article, "Utopia is just around the corner"—what a hope, if anyone seriously thinks this for normal times!

Surely, it is generally agreed now that Big Business and Vested Interests, together with the policy of Gold and Pegged Foreign Exchanges, were not only the real rulers of this Old Country of ours, but the root cause of the present war. One concludes the idea is that shipping, transport and everything else which in the past has made this country great, can "go hang" in future, for the benefit of the few, at the expense of the many; and, no doubt we are asked to believe that this is the advice of professional economists, for the general good.

It seems to me so perfectly clear that the suggestions made in your article would benefit only Big Business and Vested Interests, completely at the expense of small Businesses and the "Little Man". Why should the latter have no share of consideration and no right to live? Besides, has there ever been a time of prosperity in the past when the so-called "Little Man" (the intermediaries of ordinary business) has not been prosperous? I say emphatically that some people are blind—yes, absolutely blind—to the interests of everyone except their own selfish selves. What a post-war future on these lines!

Pardon that I mention just one other point. I see that the "National Bread" is still being discussed, but isn't it the fact that wartime needs for it make discussion superfluous? Does anyone deny the need for the present wartime flour, and does any thinking person seriously believe that we will get through this war without our bread being changed even a great deal more? We must get used to a few things we don't like and get on with the war; or, better that some of us had never been born in this age at all.

Meanwhile, again let me wish FOOD MANUFACTURE, and your own personal efforts for everyone, the continued success so well merited.

Yours faithfully,
F. M. KNIVETON.

WIRRAL, CHESHIRE.

New Zealand Agar Agar

TO THE EDITOR OF FOOD MANUFACTURE

DEAR SIR,—In the number of your journal issued on July 1, page 179, is a note headed "Agar-Agar Substitute," which describes briefly experimental work performed in New Zealand on the production of this material. Although the New Zealand agar-agar has not been derived from the same species of seaweed as the Japanese product, the species concerned, *Pterocladia lucida*, is very closely allied and the material produced from it is not a substitute one, but is, in fact, a true agar-agar. It has now been thoroughly tested by the Imperial Institute and tried out by a wide range of chemical and commercial users. To all intents and purposes it has been found to have the same properties as Japanese agar, and is not comparable with substitutes that can be produced from such material as the Irish moss seaweeds, gigartina spp., etc.

Yours faithfully,
A. L. POOLE,
Asst. Scientific Liaison Officer.

NEW ZEALAND GOVERNMENT OFFICES,
415, STRAND, W.C. 2.

News from the Industry

Use of Egg Products in Establishments

In order to encourage the use of processed eggs by the catering trade, the Minister of Food has made an Order amending the Meals in Establishments Order, 1942, by excluding egg products from the definition "Egg" in the Order. As a result of this amendment, the presence of egg products in a dish will no longer make it a main or subsidiary dish for the purposes of the Order.

The amendment will have the further effect of removing the doubt which has been expressed in some quarters whether the use of egg products for the preparation of a main dish, such as roast beef and Yorkshire pudding, was permissible under the Order, since it involved the mixture of different specified foods—*i.e.*, egg and meat—in the same dish, mixtures which are prohibited by the Order. This amendment does not affect the position in regard to shell eggs. It will still be lawful to serve shell eggs as part of the same main dish as other specified foods. Thus bacon and shell egg in any form cannot be served as one dish.

* * *

Sale of Cooked and Pressed Chaps

The Ministry of Food wishes it to be understood that, while the Meat Products and Cooked Meat Order provides that pig's head or pig's head meat may not form an ingredient of cooked or pressed meat or pork, it does not prohibit the sale of cooked and pressed chaps as cooked chaps.

* * *

Mr. Eric Mackintosh

The Ministry of Food announces that Mr. Eric Mackintosh has been appointed deputy director of chocolate and sugar confectionery. He has been chairman of the rationing committee and the control and distribution committee of the Chocolate and Sugar Confectionery Wartime Associations.

Cheap Milk for Children

To enable non-grant-aided schools to obtain milk for their pupils in the same way as grant-aided schools at the cheap rate of ½d. per third of a pint, the Ministry of Food has extended the Milk-in-Schools Scheme to these schools, dating from August 1 last.

Schools in England and Wales will, as far as possible, be notified of the arrangements by Food Offices. Any school desiring to obtain a supply of milk under the scheme will, on application to the Food Office, obtain a certificate that it has been authorised to do so. This it will forward to its milk supplier, who will send it to the Milk Marketing Board with a notice of his intention to supply the milk. The Milk Marketing Board will then register the school under the scheme.

If the supplier has not already been approved under the scheme, it is strongly recommended that the school should consult the Medical Officer of Health, especially if the supply is not pasteurised.

* * *

Growing of Rye

The Government wishes farmers to grow much more rye for the 1943 harvest on the lighter soils that are not suitable for wheat. Rye is a valuable grain for such soils, and can be used for human food and for certain industrial purposes and thus save shipping that would be used to import wheat or maize.

It has therefore been decided to make an acreage payment of £3 per acre for rye of the 1943 crop that is fully ripened and threshed as grain. No payment will be made in respect of rye grown for cutting green as fodder. The maximum market price will be 14s. per cwt. (63s. per quarter).

For a crop of 3 quarters per acre the total return will be 88s. per quarter, an increase of 13s. 3d. per quarter over the 1942 price.

It is hoped that farmers will respond and increase substantially their sowings of rye in Great Britain and Northern Ireland in the forthcoming season.

Dripping and Edible Oils

The Minister of Food has revoked the Margarine, Cooking Fats and Edible Oils (Control of Sales) Order, 1940, and made a new Order entitled the Dripping and Edible Oils (Control of Sales) Order, prohibiting trade users from obtaining, or persons from supplying, dripping and edible oils except against a buying permit issued by, or on behalf of, the Minister of Food. Sales of margarine and cooking fats (including lard) to trade users will in future be controlled under the revised General Rationing Order.

Permits already issued under the Margarine, Cooking Fats and Edible Oils (Control of Sales) Order will be valid under the revised Orders.

* * *

Milk for H.M. Forces

The arrangement under which fresh milk has been available for Service personnel since May last ceased on July 31, and the home Forces will generally take their milk in the form of condensed milk. There are, however, certain exceptional cases in which liquid milk will still be provided.

Among those who will receive liquid milk are personnel under eighteen, female personnel and sick personnel.

* * *

Ministry of Information Films

Mr. Thomas Baird, of the Films Division of the Ministry of Information, has recently returned from a visit to the U.S.A., where he showed some British agricultural films to officials of the Department of Agriculture. These films were very well received, and Mr. Baird has arranged for a reciprocal service of American agricultural films for showing in this country.

As this matter aroused considerable interest on this side, Mr. Baird showed some of the films, both British and American, in the Ministry of Information's theatre at Senate House, Malet Street, W.C. 1, on July 22.

London Chamber of Commerce

Lieut.-Colonel G. R. Harding, D.S.O., and Mr. J. McLean have been re-elected Chairman and Deputy-Chairman of the Council of the London Chamber of Commerce, and Mr. C. Douglas Scriven Treasurer for the year.

* * *

Dr. W. E. Gaunt

Ashe Laboratories, Ltd., announce that Dr. W. E. Gaunt has been appointed Research Director of the Ashe group of associated companies. Dr. Gaunt has made contributions to the literature in a number of different fields, and his wide research experience should prove invaluable in enabling him to tackle the diverse problems which he will meet in his new post.

* * *

Provender Millers

Mr. H. B. Stone (Messrs. Hodder and Stone), who presided, was re-elected by the Provender Millers' Association (South-West Area) as chairman for the fourth consecutive year, with Mr. R. J. Pugsley (J. Rank, Ltd.) vice-chairman. Other appointments were: Hon. treasurer, Mr. F. W. M. Gladwyn (R. and W. Paul, Ltd.); hon auditor, Mr. W. R. Harford (Spillers, Ltd.).

Messrs. H. B. Stone, F. Jerrim, and F. F. Thompson were re-elected area representatives on the National Association of Provender Millers.

* * *

Association of British Insecticide Manufacturers

At the annual meeting of the Association the following officers and Executive Committee were elected for the year: *Chairman:* Mr. H. J. Jones (Hemingway and Co., Ltd.); *Vice-Chairman:* Mr. F. H. Hall (Bugges Insecticides, Ltd.); *Treasurer:* Mr. E. Z. Bolt (G. H. Richards, Ltd.); *Auditor:* Mr. R. A. Blair (Burt, Boulton and Haywood, Ltd.); *Executive Committee:* Messrs. R. A. Blair, R. V. Craven, F. H. Hall, E. Holmes, J. S. Mitchell, and J. E. R. Simons. Messrs. A. J. Holden, B.Sc., F.I.C., and W. A. Williams, B.Sc., were appointed Assistant Secretaries.

OBITER DICTA

We should have to be careful or we should present our food in such a dull form that it would not render half the service which it might.—*Sir John Russell, speaking at the Nottingham Rotary Club.*

* * *

Mrs. Drummond found a popular "beauty" diet for ladies of Napoleonic times. These ladies had for breakfast boiled beef steak (underdone) and half a pint of bottled ale. This "treatment" was repeated for their 2 p.m. dinner. Vegetables, fruits, sweets and pastries were strictly forbidden.—*The Star.*

* * *

I hope that local authorities will help to improve the status of fish and chip shops. They wanted to create in every town shops which the best people could patronise with dignity.—*Mr. Henry Youngman in his Presidential Address to the Annual Conference of the National Federation of Fish Fryers.*

* * *

The handsome, hump-backed perch is definitely one of the most attractive of our coarse fishes for table purposes. The future life of other fishes in Windermere will be a lot easier when large numbers of this prospective *herrenvolk* have found their way into tins.—*Manchester Guardian.*

* * *

You can't buy a pound of vitamins from your grocer, but that doesn't mean they don't exist in tangible form. There are quite a lot of people who mix up vitamins with calories, which, of course, are very different, because you can't see and eat calories. But you can go into a chemist's shop and he will be able to show you a drachm of vitamin C or half-an-ounce of vitamin E.—*G. Morley Davies, writing in Bristol Evening World.*

* * *

What would you recognise as an egg substitute powder? I would want it to take the place of an egg in causing flour to rise and to have a reasonable amount of nutritive value.—*Woman witness in egg substitute prosecution.*

* * *

Manufacturers are fully aware that there is magic in the name "egg substitute" which would be lost if the product were described correctly as coloured baking powder.—*Dr. Johnstone Jervis, Leeds M.O.H.*

* * *

I prefer American to Scots cooking—it's dietetically better.—*Robert Wilson, recently appointed chef to the leave club for U.S. service men, Edinburgh.*

Mr. W. E. Callingham

Mr. William E. Callingham, A.M.I.Chem.E., has been appointed Managing Director of the Watford Chemical Co., Ltd. He has been associated with the chemical industry since 1919, when he was demobilised from H.M. Armed Forces. Among the industries with which he has been associated are Fine Chemicals, Leather (Research), Beet and Cane Sugar Production and Sugar Refining, Activated Carbons and Radium and Uranium Production. From 1930 he was Chemical Engineer in charge of the Technical Division of Utilities Improvements, Ltd.

Later he became Technical Manager of Urgeirica Radium Consolidated—a company owning and operating radium and uranium properties in Portugal. Over many years Mr. Callingham has made contributions to the literature of the sugar industry.

* * *

OBITUARY

Mr. John Scott

Mr. John Scott, one of the best-known men in the Scottish jam, fruit and preserve trade, died at Orchard House, Carluke, on June 26. He was chairman of Messrs. R. and W. Scott, Ltd., of Carluke, and had spent a lifetime in the service of the company which he established as one of the premier firms in the Scottish jam trade. He was eighty years of age, but continued to take an active interest in the firm.

* * *

Mr. Andrew Risk Buchanan

Mr. Andrew Risk Buchanan, of Messrs. John Buchanan and Bros., Ltd., manufacturing and wholesale confectioners, of Glasgow, died on June 24 suddenly at Keir Street, Glasgow.

Mr. Buchanan had been in the Glasgow trade all his life and was well known to all sections of the manufacturing and distributing industry there.

* * *

Change of Address

The address of George W. M. Armour, Ltd., is now 39, St. Pancras Way, Camden Town, London, N.W. 1. Telephone: Euston 1778.

Cost of Government Advertising

In a written Parliamentary reply, Sir Kingsley Wood, Chancellor of the Exchequer, states that Press advertising expenditure by Government Departments from September 1, 1939, to June 30, 1942, amounted to approximately £3,805,000.

The total includes National Savings Committee, £1,251,100; food, £835,000; Air Ministry, £414,100; agriculture, £186,000; labour, £168,000; war transport, £151,000; War Office, £133,400; Admiralty, £63,000.

* * *

Storage Equipment

The problem of finding space to store more or storing more in less space is one which constantly confronts those concerned with storage, its immobility being the "bottle-neck" of restriction between production and distribution.

The cause of waste in structural storage (as distinct from bulk) mainly arises from the excessive proportion of corridors, gangways, or passages existing between every two ranks. Only a comparatively small part of the gangway space is used at any time and the unoccupied part is therefore uneconomic, particularly in many instances where 50 per cent. or more of the floor space is taken up by gangways. The conception that static storage conditions retard industry led to the study of movement to render structural storage flexible, and an invention (commenced early in 1936) evolved a system subsequently proved to concentrate storage by movable units with the effect of great reductions in length and number of corridors employed. This was the Stormor Storage Equipment, manufactured and distributed by J. Glover and Sons, Ltd. The system partly maintains normal fixed structures, but in front are added one or more ranks of storage in moving units placed closely together. An empty unit space in each rank provides accessibility to any point by movement of the units. Thus all space units in each rank, of which all but one are occupied by mobile units, are available for use alternatively for storage and access purposes. Such is the dual use of space.

Concentrated Milk

The combined output of all kinds of concentrated milk in April was 28,988,533 lbs., compared with 17,467,311 lbs. in March and 22,107,178 lbs. in April of last year. The whole milk products account for a total of 20,004,669 lbs., or 83 per cent., and the by-products for 3,983,864 lbs., or 17 per cent. The manufacture of the various items during the four months ended April 30, 1942, amounted to 63,921,043 lbs., compared with 62,626,256 lbs. in the coresponding period of 1941 and 48,522,228 lbs. in that of 1940.

* * *

Corrosion Resisting Steels

An informative booklet which tells all about "Staybrite" steel has recently been produced by Firth Vickers Stainless Steels, Ltd. The tables showing the effect of various acids on carbon, stainless and "Staybrite" steels are particularly useful, the concentration of acid, temperature and effect being ascertained at a glance. The materials included are not only acids, but food substances such as potato, pickles, salad cream, sauces, tomato, etc. The different grades of the steel and their applicability for special purposes are described. There are fourteen pages of illustrations of typical plant fabricated with the steel.

* * *

Hotels and Ice Cream

Hotel and restaurant keepers are hoping that the Ministry of Food ban on ice cream, which will operate from September 30, will only apply to factory manufacture and will not prevent them from serving ice cream with meals. The new Order will release refrigerator space for food storage and skilled labour of engineers for war work. It will also release fats and sugar for inclusion in foods which are more widely distributed.

Caterers, however, say that the service of ice cream with meals is not sufficiently large to add any appreciable quota of fats and sugar for use with other foods, and as it is manufactured on the premises will not release storage space. They have made representations to the Ministry.

Saving of Petrol

Five hundred thousand gallons of petrol, sufficient to keep a complete squadron of Spitfires in flight for 618 operational hours or maintain a troop of Waltzing Matilda tanks going all out for 24 hours a day for 15 months, is being saved annually by the Cake and Biscuit Manufacturers' Wartime Alliance.

This considerable saving, which is apart from the entailed economy in man-power, rail transport and such vital materials as tyre rubber, is being made by the Cake and Biscuit Manufacturers' Wartime Alliance under their zoning system and pool delivery scheme, both of which have been effected in agreement with the Ministry of Food. The zoning system, whereby biscuit manufacturers sell only within specified areas, was organised in order to economise on transport and man-power.

Under the biscuit pool delivery scheme manufacturers are pooling their deliveries with the utmost efficiency, and many vans now seen on the road carry as many as six competitive makes of biscuits. Both zoning and pool delivery mean a sacrifice, in the national interest, of public goodwill built up by biscuit manufacturers at considerable expense over a number of years. The former entails the giving up of valuable sales areas, while the latter entails the public disappearance of many of the colourful vans of well-known biscuit manufacturers.

* * *

Refrigeration in Wartime

We are reminded that in addition to their standard "UDEC" Refrigerating Plant being supplied for a large number of cold stores, etc., the U.D. Engineering Co., Ltd., are fully employed at the present time in producing refrigerating equipment for chemical industries to meet wartime requirements. Numerous installations already completed include far-reaching improvements in specialised refrigerating plant for all industrial purposes, details of which, however, can only be available at some time in the future.

Developments in refrigerating plant for very low-temperature work are continually being made at the Company's extensive works, where all equipment is designed and manufactured.

Chemical Plant Manufacturers' Association

The following were appointed at the Annual General Meeting held in June to serve as the officers and Executive Committee of the British Chemical Plant Manufacturers' Association for the ensuing year:

Chairman.—Dr. G. E. Foxwell (Clayton, Son and Co., Ltd.).

Vice-Chairman.—Mr. K. Fraser (W. J. Fraser and Co., Ltd.).

Hon. Treasurer.—Mr. W. S. Knight (Kestner Evaporator and Engineering Co., Ltd.).

Past Chairmen.—Mr. B. L. Broadbent (Thomas Broadbent and Sons, Ltd.); Dr. H. J. Bush (Huntington Heberlein and Co., Ltd.); Mr. J. H. G. Monypenny (Brown Bayley's Steel Works, Ltd.); Mr. J. Arthur Reavell (Kestner Evaporator and Engineering Co., Ltd.); Dr. R. Seligman (Aluminium Plant and Vessel Co., Ltd.); Mr. J. W. Wright (Cannon Iron Foundries, Ltd.).

Elected Members.—Mr. W. R. Beswick (Ashmore Benson Pease and Co., Ltd.); Mr. D. M. Henshaw (W. C. Holmes and Co., Ltd.); Mr. G. N. Hodson (Hathernware, Ltd.); Mr. W. J. Hooton (S. H. Johnson and Co., Ltd.); Mr. S. J. Ralph (Aluminium Plant and Vessel Co., Ltd).; Mr. B. N. Reavell (Lennox Foundry Co., Ltd.).

Co-opted Members.—Mr. H. G. Edmonds (Baker Perkins, Ltd.); Mr. J. C. Haithwaite (John Thompson [Dudley], Ltd.); Dr. R. Lessing (Hydronyl Syndicate, Ltd.); Mr. J. MacGregor (Geo. Scott and Son [London], Ltd.).

* * *

Canadian Honey

Increased production, together with a stronger demand indicated for the 1942 honey season, is reported from Ottawa. Generally, according to the Department of Agriculture, bees come through the winter well, particularly in Ontario, where the reports are exceptionally good. Although the numbers of beekeepers and colonies in Canada in 1941 were the highest on record, further increases are predicted for 1942 in most provinces, the increases in beekeepers ranging from 5 to 10 per cent. in the numbers of colonies in apiaries already established. Orders for package bees for restocking have been heavy.

Food Transport

One of the oldest road transport companies operating in the Midlands, P. X. Ltd. specialises in the distribution of foodstuffs to the retail trade. Trunk services operate daily between all depots which are situated at Manchester, London, Northampton, Leicester, Rushden. Manchester depot is also responsible for any collections at Liverpool, to which place a van is sent each day.

Local services radiate from each depot, which are provided with loading docks, and at the largest depots these are in the form of an island, in order that large tonnage can be handled with a minimum of effort.

Since the commencement of the points rationing scheme a considerable tonnage has been handled from the buffer depots for retail distribution on behalf of some of the best-known wholesalers; and as the Midland area served by P. X. vans extends from Hitchin, Luton, Peterborough to Burton-on-Trent and Nottingham, and at Birmingham connects up with Central Carriers, an associated company who again serve the whole of the West Midlands, distributors can therefore hand all their deliveries for a very large area to one contractor.

* * *

Yeast in Food Manufacture

An interesting report was recently made by two scientists on Yestamin, a yeast product in powder form. On being submitted to the tests usually applied to foodstuffs in order to determine their relative feeding values, its protein content was found to be 48·31 per cent., its proportion of useful minerals high, and its fibre content low. An assay for vitamin B_1 and riboflavin showed that the product is a particularly rich source of the vitamins of the B group.

It is pointed out that most vegetable and animal products contain considerably less than one-tenth of the proportion of vitamin B_1 which is found in Yestamin, while the relative proportion of riboflavin found even in the richer sources is rarely more than one-quarter.

This vitamin potency is of particular importance at the present time, in view of the official opinion that the B_1 intake of the community must be raised.

The high protein content and the rich, "meaty" flavour of the product especially commend it to food manufacturers as a most useful and valuable ingredient—one that could be used to great advantage in making food products of many different types.

The English Grains Company, Ltd., are the manufacturers.

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America Praises British Farming

The American Press has been handing bouquets to British farmers, following a recent speech by Mr. C. Bosanquet, Assistant Secretary at the Ministry of Agriculture. Addressing the Agricultural Club of Chicago, Mr. Bosanquet expressed the thanks of the farmers of Britain to American farmers and manufacturers for the food and machinery sent to aid them in their fight—a fight on which they have staked their national existence. The *Chicago Sun* commented on Mr. Bosanquet's description of what the British farmers are going through in order that all possible food may be grown in the British Isles. It was, they said, "an eye opener".

* * *

Condemned Foodstuffs

During the four weeks ended on June 25, the unsound foodstuffs condemned by the inspectors of the Manchester Markets Committee included 27¼ tons of meat, 28¼ tons of fish (13 tons of which remained unsold after several days), 13½ tons of vegetables (8½ tons of which were unsold after several days), a quarter of a ton of canned and dried fruit, 300 head of game, 606 head of poultry, 2,220 rabbits, 62 eggs, 693 lbs. of jam and other groceries, 1,319 lbs. of canned, condensed and evaporated milk, and 1,462 lbs. of canned luncheon meats.

* * *

Citrus Toffee

Toffees made of citrus and only one-tenth the weight of an orange are reported as being made in South Africa. They contain orange concentrates, retaining nine-tenths of the juice of the original orange and can be eaten or made into drinks.

Trade Union Agreement for Canteen Workers

The first agreement of its kind to be entered into by any section of the catering trade in this country was concluded on July 22, when representatives of the National Society of Caterers to Industry, on behalf of the employers, and representatives of the National Union of General and Municipal Workers and the National Union of Distributive and Allied Workers, on behalf of the employees, signed a national agreement governing minimum wage rates and working conditions for factory canteen workers in the war industries.

The agreement came into operation as from the commencement of the first pay period following August 2, 1942.

A National Joint Industrial Council, comprising representatives of the two trade unions and the National Society of Caterers to Industry, has been formed to secure the greatest possible measure of joint action between the employers and employees in the industrial catering trade and to provide for arbitration in the event of disputes.

Members of the National Joint Industrial Council and signatories to the agreement are:

For the National Society of Caterers to Industry: H. J. R. Stent (Barkers [Contractors], Ltd.), L. W. Stark (John Gardner [London], Ltd.), A. C. Moon (Catering Contractors, Ltd.), N. Abrahams (Staff Caterers, Ltd.), Alan Hall (K. and A. Hall [Caterers], Ltd.), and Arthur Lawson, secretary of the Society.

For the employees: Messrs. T. Williamson and T. Cochrane (National Union of General and Municipal Workers), G. Beardsworth and R. Turner (National Union of Distributive and Allied Workers).

* * *

Vitamin K and Tooth Decay

According to a recent article in *Science*, it is probable that if synthetic vitamin K were incorporated in sweets it would effectively inhibit dental decay. It is stated that vitamin K is probably one of the substances removed from sugar-cane juice during the manufacture of refined sugar.

Canadian Soya Bean Culture

Canadian Sugar Factories, Ltd., at Raymond, have contracted for approximately 350 acres of irrigated land in the Eastern Irrigation District to be sown to soya beans this year. Farmers will be watching the large-scale experiment closely, for if successful it will open up an important market in this district. To make the test a thorough one, the beans are to be distributed to five or ten farmers in each of the eleven districts of the project, and each farmer will grow from five to ten acres of this increasingly useful legume. The seed is being distributed by J. W. Eshom, of the Brooks Board of Trade agricultural committee, and its planting, growing and harvesting will be supervised by M. L. Freng, district agriculturist. In the contracts signed by the growers are stipulations that they will undertake to sow at the rate of 50 lbs. per acre, will use a legume inoculation provided by the contracting company, and will study and follow instructions on growing methods, also supplied by the sugar company. The two varieties being introduced here are the Kabott and Pagoda, both of which have been matured successfully on small acreages in the past.

* * *

Sale of Dehydrated Meat

Butchers are reported to be asking who will handle the distribution and sale of dried meat if it is put on the market by the Ministry of Food. They are convinced that it will eventually be supplied as part of the meat ration and think that it should be handled by them and not by co-operative and multiple stores.

* * *

Egg Substitute

When coloured baking powders are sold as egg substitute they should contain not less than 8 per cent. of total and 6 per cent. of available carbon dioxide, Mr. T. D. Lucke, Borough Analyst, is reported to have stated when giving evidence in an egg substitute case at Southend. This was disputed by the defence on the grounds that no authority could be quoted for the figures given.

Mr. J. H. Thorpe

The President of the Board of Trade has appointed Mr. J. H. Thorpe, O.B.E., K.C., to be Chairman of the Central Price Regulation Committee in succession to Mr. Raymond Evershed, K.C., who has been appointed a Regional Coal Controller by the Minister of Fuel and Power.

* * *

Resignation of Mr. F. Beattie

The Ministry of Food announces that, owing to his election as Member of Parliament, Mr. F. Beattie, D.L., J.P., has resigned his appointment as Trade Adviser on Bread Supplies and Deputy Director for Emergency Bread Supplies in Scotland.

Matters with which he was dealing, in connection with applications for machinery and building licences, and permits for ancillary materials, are now being handled by the Bread Division of the Ministry of Food at Chatsworth, Whitehall Road, Colwyn Bay, where replies to any outstanding letters should be addressed.

* * *

Mr. G. V. Downer

Mr. G. V. Downer would like all his old friends to know that he is still practising as a lighting consultant, and while concentrating for the time being on problems of wartime economy, is preparing for post-war developments. His address is 29B, Torrington Square, W.C. 1.

* * *

Farming Scholarships

Free scholarships for British youth intending to take up farming as a career are being provided by Mr. Henry Ford and his son, Mr. Edsel B. Ford.

The scholarships will be taken up at the Henry Ford Institute of Agricultural Engineering, Boreham, near Chelmsford, Essex, and will commence towards the end of September.

Intensive training in both theory and practice will be of particular value to British agriculture, since special emphasis is laid on mechanisation. There is a great need at the present time for men who can get the best out of the vast number of tractors and other machines now in use.

COMPANIES

General Electric Company

Losses sustained in China, Malaya and Burma by the General Electric Co. have been provided for, and the audited accounts of this well-known electrical equipment manufacturing company covering the twelve months to March last show that the trading profit, plus dividends from subsidiaries and other income, amounted to £1,725,137, after providing for E.P.T. This represents a small increase in relation to the previous year's figure, and after allocating £460,795 to depreciation, £78,911 to the pensions fund, £4,485 for directors' fees, and £685,000 to income tax reserve, the net profit is £495,946, or a decline of only £7,722. The rate of dividend on the Ordinary stock has been maintained at 17½ per cent., the appropriation account being made up in the manner indicated below:

	£
Brought forward from 1940-41	812,791
Net profit—year ended March, 1942	495,946
Disposable balance	£1,308,737

	£
6½ per cent. dividend on "A" Preference capital	58,500
7½ per cent. dividend on "B" Preference capital	67,500
17½ per cent. dividend on Ordinary stock ...	867,358
Carried forward to 1942-43	815,379
	£1,308,737

Properties, plant, etc., are shown on the balance sheet at £5,201,680, and activity of operations is reflected in the stocks and work in progress, which have increased in value from £5,847,816 to £5,852,462.

* * *

Confectionery Payment Reduced

In view of all the circumstances affecting supplies of raw materials, little surprise will perhaps be occasioned by the reduction in Ordinary dividend proposed by R. S. M'Coll, Ltd., the well-known manufacturing and retail confectioners, Glasgow. The payment is to be 2½ per cent., against 6¼ per cent. Some interest, however, will be aroused by the relationship between the net profit figure of £3,390 (which compares with £21,759 for the previous year) and the amount of taxation.

In the form of Income-tax and E.P.T. this amounts to £31,679 already paid, while from the available balance a sum of £3,500 is placed to taxation reserve. The company's standard for E.P.T. is, of course, none too favourable, but even on a capital standard a reduction in the net profit to the level could, it would seem, be explained only by allocations additional to those allowed for tax purposes. In that case the future position would be proportionately safeguarded.

* * *

The Distillers Company

The yeast factories controlled by The Distillers Company have been maintained in full production, and the high quality of the product has been preserved. After charging depreciation of fixed assets, taxation and contingencies, and reserving a further sum for investments, the profit for the year amounts to £1,962,168, and it was decided to make the following allocations: To reserve fund, £500,000, bringing the total up to £2,500,000; to fire insurance fund, £100,000, making it £925,000; and £100,000 to a new reserve for war contingencies. The balance remaining enables the dividend and bonus to the Ordinary stockholders to be maintained at the same figure as for the previous year, and the great financial strength of the organisation is reflected in holdings in gilt-edged securities which, at the date of stocktaking, amounted to nearly £12,500,000.

* * *

Walters' "Palm" Toffee

Walters' "Palm" Toffee is to pay the 2½ per cent. balance of dividend on the 7½ per cent. Cumulative Preference in respect of the half-year ended December 1, 1932, also 2½ per cent., being the final part of the balance of subrogated rights.

SCRIBBANS & CO., LTD.

LARGER PROFITS DESPITE DIFFICULTIES

The Fifteenth Annual General Meeting of Scribbans and Company, Limited, was held in London on July 29, Mr. Philip E. Hill, the Chairman, who presided, said: The profits for the year, after making provision for taxation, amount to £118,571, against £115,370.

Our sundry trade and other creditors show a very considerable increase, but the whole of this increase is attributable to the provision for taxation. There is also a very considerable increase in our stock-in-trade, and you will, I am sure, agree with me that this is a very wise provision. The increase in the investments in the subsidiary companies is occasioned by the purchase of a block of shares in our main subsidiary, George Kemp, Limited, on terms which we considered advantageous to your company. You now own 90 per cent. of the shares of this company's capital.

The difficulties which I mentioned to you last year have been intensified during the year under review. Large numbers of our workers have been drafted either to the Services or to other industries and, like other industries, we are working with very reduced staffs. The transport restrictions by the Government have necessitated our main biscuit company giving up some 60 per cent. of its selling territory, but we feel that our many customers in these lost areas will remember us, and we look forward to re-establishing our connection in happier times.

Rationing is a term which is, I am sure, familiar to all of you, and it may interest you to know that some materials are restricted to 50 per cent. of our pre-war usage, and consequently we have to ration our customers very severely.

Your companies are taking their full share in the war effort of this country by supplying the Forces, works, canteens, and other priority demands. Perhaps one of the most interesting developments is a convoy service to areas where food may be needed quickly.

I should like to pay a tribute to the personnel and staff for their hard work and loyalty during the year. The Report was adopted.

Information and Advice

Deodorising Nut Oils

7,837. *We are interested in any process of which you can perhaps kindly give us details, for deodorising peanut and other such nut oils in quantity.* (Surrey.)

The deodorising of oils is a highly technical matter in connection with which you would require the intervention of an expert.

Briefly, the oil is rapidly mixed in a special vessel with animal charcoal, kaolin or Fuller's earth. The oil, after treatment, is pumped through a filter press.

Doubtless you would be able to obtain some useful information from the makers of plant, although in present circumstances it would be difficult to acquire new plant.

Vegetable Extracts

7,974. *We should be obliged if you would kindly give us some information regarding the products called Vegetable Extract, liquid and powder. We should very much like to know the ingredients and uses in food products, and also we should like to know the names of the manufacturers in this country.* (London.)

The so-called vegetable extracts are products of wheat, and the process is covered by patents. Although the products are called vegetable extracts they give a flavour resembling that of meat. Sodium glutamate will serve the same purpose, but is unobtainable at the moment.

These products are used in the flavouring of meat products such as meat rolls, sausages, pastes, soups, etc., but they are very scarce at the present moment, and we understand that the manufacturers are, for the most part, unable to supply any people but those who used them before the war.

Coffee Essence

8,026. *We are regular subscribers to* FOOD MANUFACTURE *and would appreciate it if you would send us a recipe for making coffee similar to existing coffee essences on the market.* (Toronto.)

It is difficult to give advice as to what method should be followed. Before it is possible to recommend any particular type of process it would be necessary to know the output that it is intended to produce, the amount of money intended to be laid out on plant and equipment, the grade, flavour, consistency, etc., of the product, and, in fact, all particulars that bear on the question.

Coffee (a mixture of suitable grades, with or without chicory)	4	lb.
Water	10	gal.
Glycerin	3	lb.
White sugar	18	,,
Glucose	18	,,
Caramel	½	,,

A great deal depends on the choice of raw materials and in the blending of these, and also in the method of extraction employed.

Owing to the restriction on, and scarcity of, materials you would be obliged to modify the above formula, and it is given solely as a basis for experiment.

Information Supplied

8,032. *We have had an enquiry for details of articles on the manufacture of synthetic cream using monyl stearates. We believe this is the right chemical substance that was mentioned.* (London.)

8,035. *We will be very much obliged if you will furnish us with two or three names of food machinery merchants who are likely to have hand-driven or power-driven mincing machines for sale suitable for a works canteen feeding about 150-200 employees.* (Lancs.)

8,039. *We should be glad if you would supply us with the names and addresses of firms who supply prepared powdered barley suitable for use in the manufacture of lemon barley water.* (Brighton.)

8,053. *We are interested in plant for producing fish-cakes, more especially apparatus for shaping the fish-cakes and for frying same. We are wondering whether there is any special plant for frying fish-cakes mechanically—i.e., some form of conveyor system, as opposed to the ordinary method of deep frying.* (Smethwick.)

8,044. *Could you tell us the names of makers of plants for the manufacture of "Farina" from potatoes?* (Dublin.)

8,047. *We are interested in a machine which could cut prunes and subsequently stone them, or a machine which could combine these two operations, preferably without the prunes having to be cooked. We should be obliged if you could give us any information you may have on this subject.*

8,049. *Reference your article in February issue "The Sand Plum", can you tell me where I may get a few plants or seeds with which to experiment. One of my present businesses is farming on land which fifteen years ago was considered waste, derelict, useless, and which now grows good crops of many kinds. The soil is sandy, and in view of your published comments it struck me that a trial with the sand plum might prove worth while.* (Lincs.)

8,058. *We are intending to manufacture macaroni, and should be glad if you would kindly suggest any publication on the subject, failing which could you give us a formula for the dough? Also, could you give us the names of manufacturers who produce machinery for the making of the macaroni?* (Glasgow.)

8,078. *My principals in Canada are interested in dehydrating plant suitable for drying all kinds of vegetables, including potatoes, and I would be obliged if you could put me in touch with a manufacturer of the plant.* (Glasgow.)

8,082. *We should be obliged for a recipe for tomato cocktail.* (Dublin.)

8,091. *Will you please let us know the name and address of the makers of refractometers?* (Stockton-on-Tees.)

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

Improvements Relating to the Manufacture of Butter

This inventon relates to a process and apparatus for the manufacture of butter from cream and milk by the carbon dioxide contact process which involves the use of a pressure vessel provided with a stirring device in the presence of a gas containing carbon dioxide at a pressure of ½ to 20 atmospheres while being cooled to a very low degree.

Granular butter produced in the pressure vessel is transferred together with washing water or cooling water, preferably with the exclusion of light and air, to a hydro-extractor in which the butter is held, dehydrated and then discharged with the desired water content.

The process of the present invention permits the duration of the whole buttering process, inclusive of washing, salting, dehydrating, forming and packing, to be reduced to from 2 to 9 minutes.

For the carbon dioxide either pure compressed gas or liquid carbon dioxide may be used or any mixture of atmospheric air and carbon dioxide. Air alone is not adapted for such purposes on account of its low yield of carbon dioxide and of the oxygen which is injurious to the butter fat and also because the churning would take too much time. Preferably the process is carried out in a continuous manner so that all operations, including the forming and packing, are carried out, according to season, time of lactation, feeding and breed of cow, within a space of 2 to 9 minutes. At the beginning of the operation liquid carbon dioxide may be admitted, and its expansion brings about within a very short time, that is within 5 to 60 seconds, not only the production of a well-grained butter of a matt appearance, but also the attainment of a sufficiently low temperature for obtaining a yield above the average. The carbon dioxide discharged by the valves of the pressure vessel may be utilised again by recompressing it. Of course the required low cooling could alternatively be obtained by means of a brine with a surface cooler, but this would require a longer time.

Under a carbon dioxide pressure the buttering substance will change under the effect of the regulable stirring device suddenly into one mass of foam wherein the fat globules conglomerate into smaller or larger lumps of fat. As soon as this has occurred the foam disappears as fast as it has formed; it collapses because it can no longer carry the fat globules which have agglomerated to fat clods. The butter-forming proper now takes place under the effect of the rising carbon dioxide pressure caused by the expansion of the liquid carbon dioxide admitted and of the cold created thereby. During the formation of the butter the speed of the stirring device decreases. The chief point, however, consists in letting as much fat as possible agglomerate during the foaming period, because after the foam has disappeared it will not be possible to produce it a second time. The butter fat which does not pass into foam remains in the butter milk.

With the present process and with a view to protecting the butter granules a new direction has been taken in so far as the butter after the buttering process may be at once hardened artificially by the cold produced—for example, by the expansion of the liquid carbon dioxide if this is employed in liquid form—and may be washed with constantly renewed water cooled according to the season and dehydrated by means of a hydro-extractor. By regulating the temperature of the washing water and the speed of the hydro-extractor the content of water of the butter may be varied within wide limits according to the legal rules in the different countries.

With the process of the invention a true kneading is not absolutely required. The forming machine following directly behind the hydro-extractor suffices in most cases to press the butter grains together so that neither superfluous air nor water will be found therein. But if desired the butter may also be kneaded after the centrifugal operation and before the forming.

544,809. James Senn.

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

544,147. Jenkins, G. N., and Cambio Products, Ltd.: Preparation of concentrated extracts of active physiological principles from liver tissue.

544,360. Rogers, J. H., Rogers, F. H., and Huzenlaub, E. G.: Treatment of cereals prior to flour-milling or for consumption without milling.

544,810. Walsh, C. L., and Newman, A. A.: Purification and clarification of liquids.

544,847. Bagpak, Inc.: Bag-closing machinery.

544,861. Modern Valve Bag Co.: Valve bag filling and weighing machines.

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

VALSAMA.—617,792. Cream. **The Scottish Flavour and Colour Co., Ltd.**, Mayfield Works, 27 to 29, Ratcliffe Terrace, Edinburgh; Manufacturers and Merchants.

PERCY DALTON.—617,806. Meats, fish, fruits and vegetables, all being bottled, canned, dried or preserved; cooked meats, meat extracts, jellies (for food), jams, junkets, edible oils and fats, fruit and vegetable preserves, pickles, dried herbs (for food), soups, preparations for making soups; suet, and preparations of sage and onions, or of parsley, lemon, thyme or the like for use as stuffing for meat and poultry. **Percy Dalton,** Victoria Spice Mills, York Road, Leeds; Manufacturer and Merchant. To be Associated with No. 617,805 (3342) xxx.

KENEK.—617,902. Cornflour. **Wm. Mackean, Ltd.,** St Mirren Starch Works, 25, Caledonia Street, Paisley.

New Companies

Fish Tasties, Limited. (371719.) £200. Dirs.: A. E. Kelham, "Glyn Garth", Scartho Road, Grimsby; F. Thompson, address not stated; B. S. Bellamy, 2, Fords Avenue, Healing; T. B. Northcote, address not stated.

Bridge of Hyde, Limited. (371742.) To carry on bus. of bakers, confectioners, etc. £5,000. Dirs.: W. Bridge, Hillside, Poleacre Lane, Woodley (permt. gov. dir.); Edith A. Bride, Hillside, Poleacre Lane, Woodley.

Forfars (1942), Limited. (371746.) 123, Church Road, Hove, Sussex. To take over the bus. of bakers, confectioners, caterers, etc., cd. on at 150, North Street, Brighton, by Forfars, Limited. £20,000. Dirs.: to be appointed by the subs. Subs.: C. H. Cuttriss, 17, Bishops Road, Hove, Sussex; Kathleen Tipper, 91, Trafalgar Road, Portslade, Sussex.

H. Twizell, Limited. (371748.) 26, Rosebery Avenue, South Shields. To carry on bus. of bakers, confectioners, maltsters, etc. £2,000. Dirs.: N. Boyd, 127, Ryhope Road, Grangetown, Sunderland; Elsie M. Boyd, 127, Ryhope Road, Grangetown, Sunderland.

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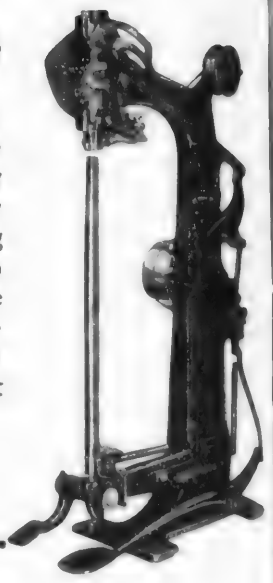
CONTAINER WIRE-STITCHER, No. 57½



This machine serves for wire stitching the bottoms of single piece corrugated or solid board containers. The pillar type Anvil has 30-in. maximum reach and suffices for firmly fastening the bottom flaps with wire stitches automatically formed, driven and clinched from a reel of Ribbon Stitching Wire 12 by 25 or 12 by 26 gauge. An interchangeable top stitching tongue with adjustable work-table can also be supplied for wire stitching, also the tops of the filled containers in place of taping. Supplied in three styles, viz.: For Treadle use, Line-shaft drive, or self-contained direct motor drive. Speed to 150 stitches per minute.

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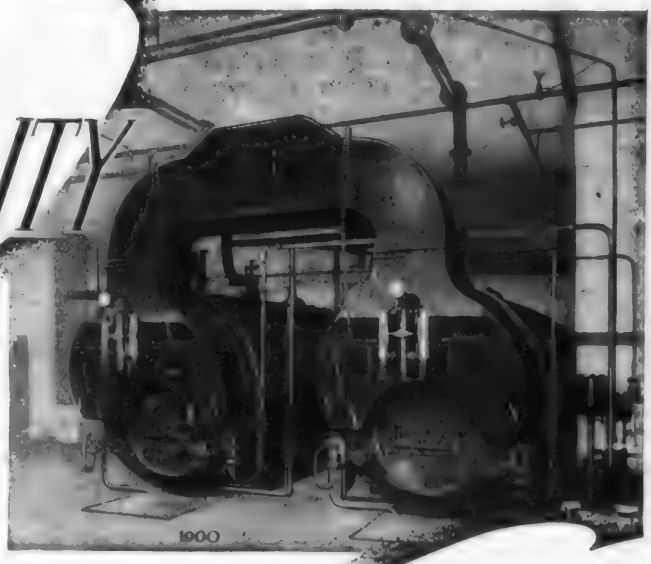

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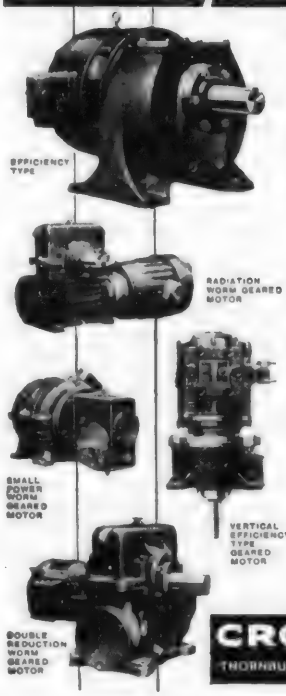
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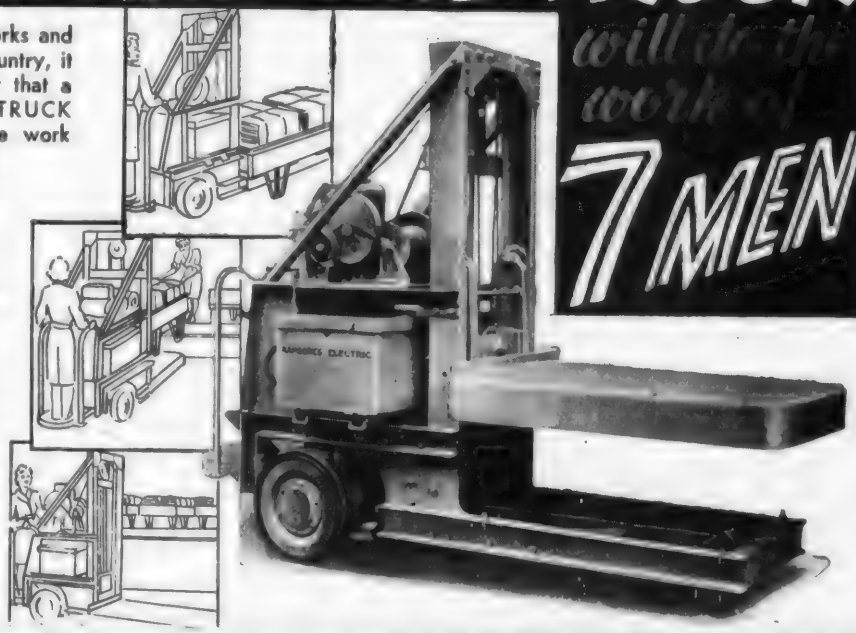

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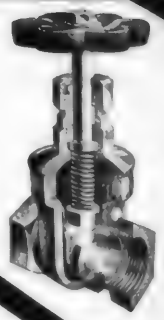

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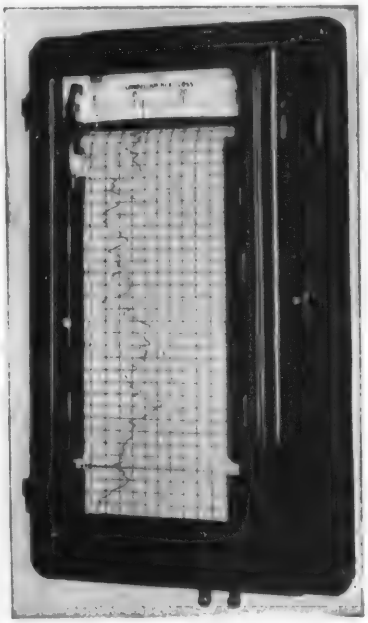

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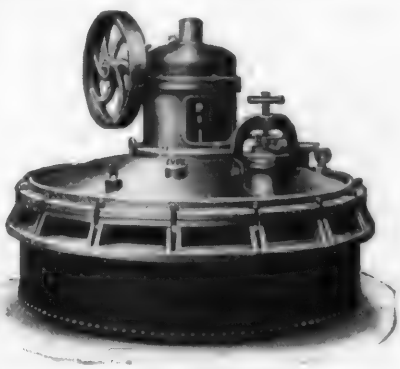

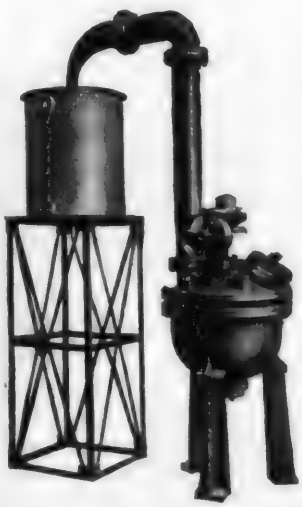

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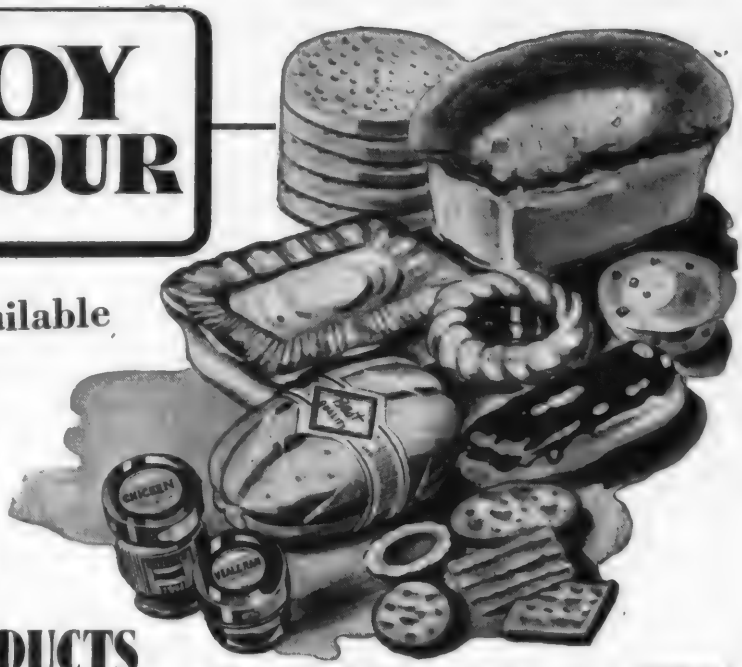

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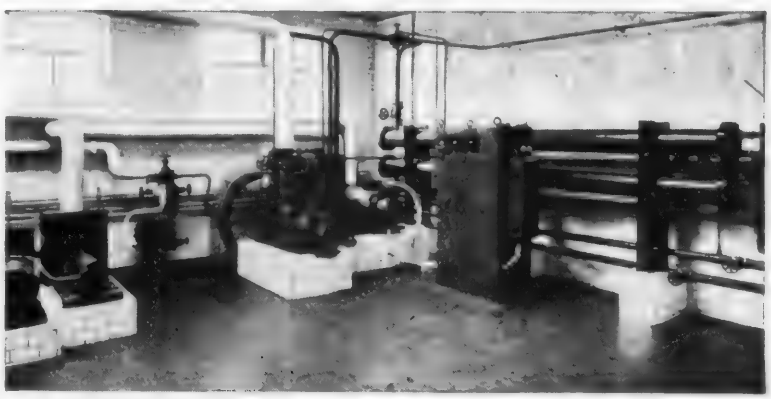

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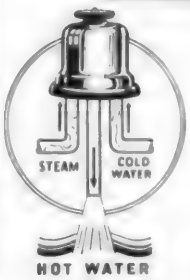

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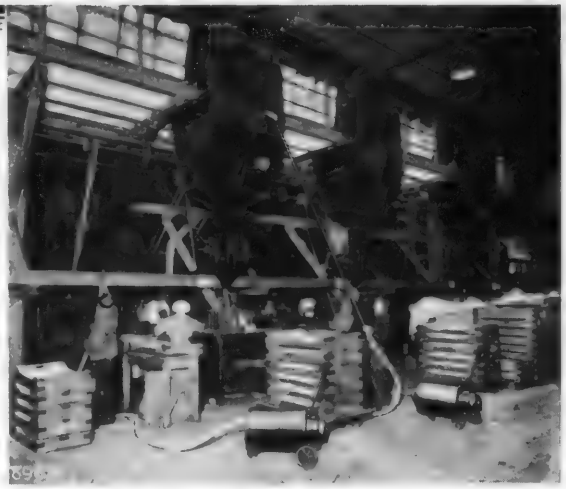

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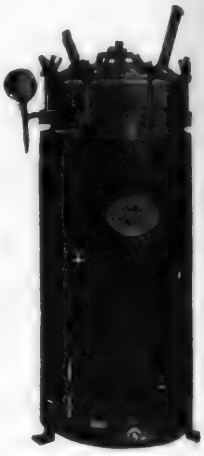

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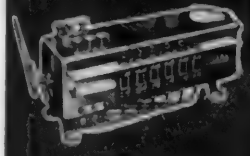

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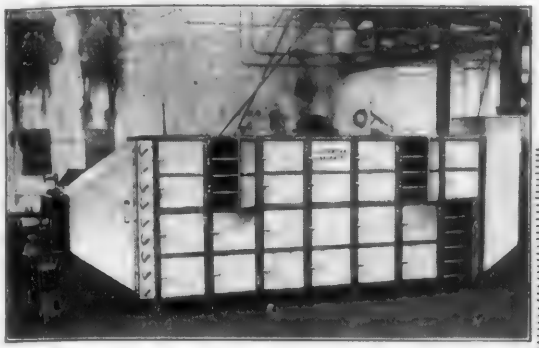

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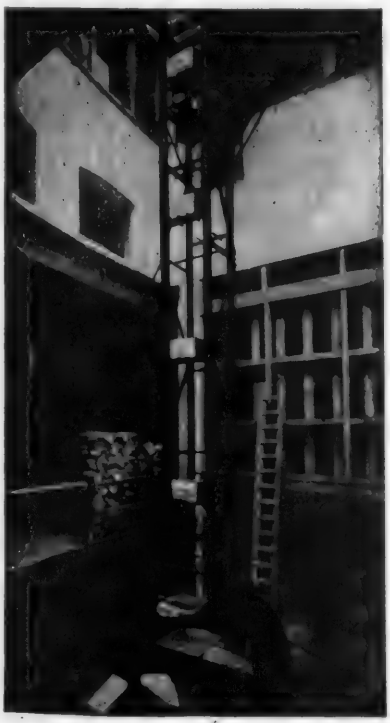

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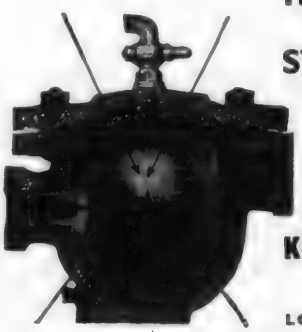

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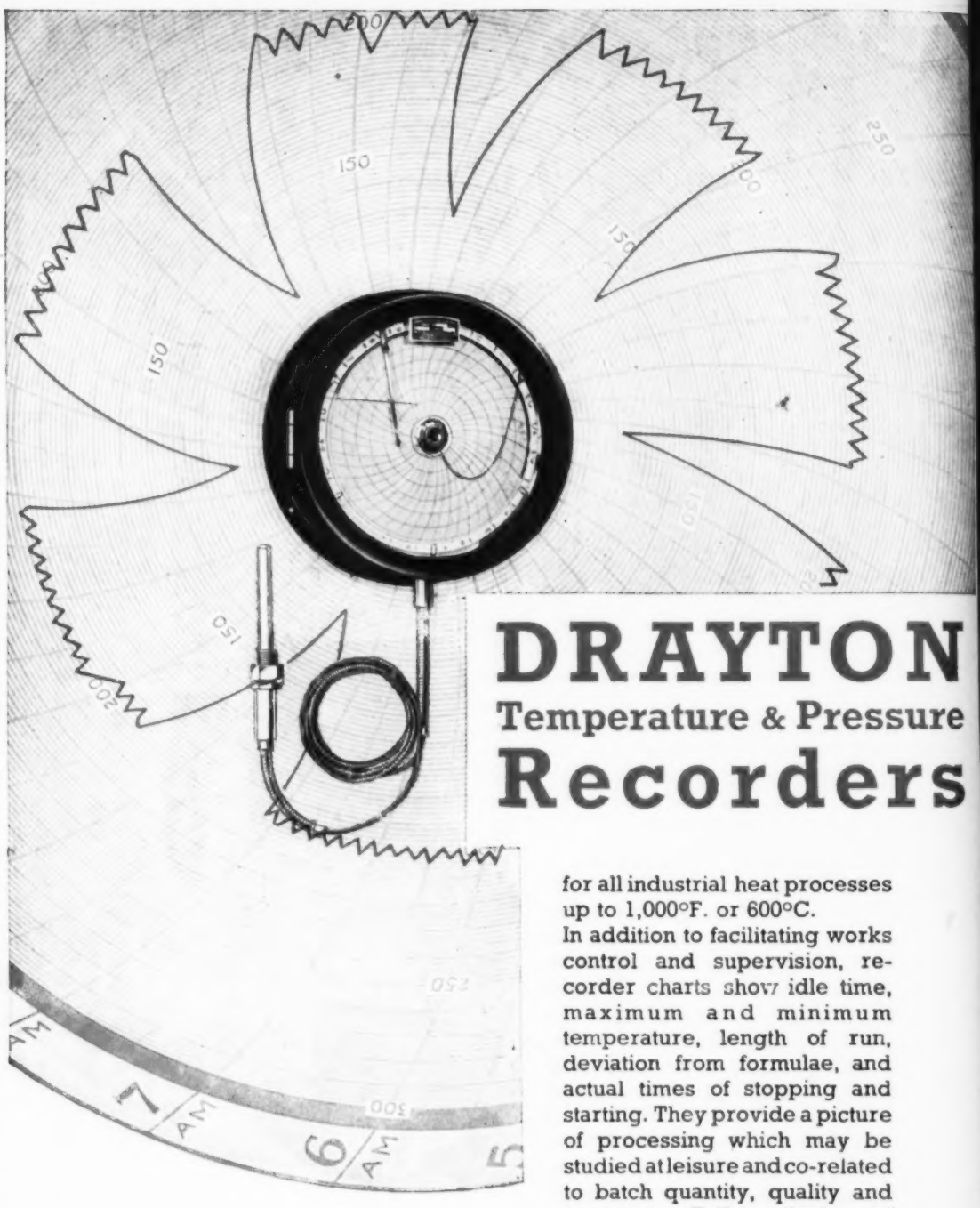

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